



CUSTOMER SERVICE
TECHNICAL SERVICE SECTION

CHECKLIST REFERENCE NO.

1175

CONTRACT: INTERMOUNTAIN

UNIT NUMBER: 1

ST NUMBER: 11246

COMPLETED COPY

SECTIONS 1 - 9

THE ENCLOSED DOCUMENTS FORM A RECORD OF MEASUREMENTS TAKEN
DURING STRIPDOWN / REBUILD OF THE MACHINE IDENTIFIED ABOVE

IP7006901



CUSTOMER SERVICE
TECHNICAL SERVICE SECTION

CHECKLIST REFERENCE NO.

1175

CONTRACT: INTERMOUNTAIN

UNIT NUMBER: 1

ST NUMBER: 11246

Signed: _____ for Stripdown

Signed: _____ for Rebuild

THE ENCLOSED DOCUMENTS FORM A RECORD OF MEASUREMENTS TAKEN
DURING STRIPDOWN / REBUILD OF THE MACHINE IDENTIFIED ABOVE

IP7006902

CHECKLIST SECTION INDEX

Checklist No. 1175

<u>SECTION</u>	<u>TITLE</u>
1	QUALITY PLAN
	TURBINE STRIPDOWN
2	HP CYLINDER
3	COUPLINGS AND PEDESTALS
4	Not used
	TURBINE REBUILD
5	HP CYLINDER WORKS BUILD
6	HP CYLINDER SITE BUILD
7	HP CYLINDER MACHINING DATA
8	COUPLINGS
9	BEARINGS AND PEDESTALS

FIELD QUALITY PLAN PAGE 1 of 1

PLAN TYPE: OVERHAUL

CONTRACT PLAN No: IM/01/001

PREPARED BY: W.H. FALCONER

CONTRACT NAME: INTERMOUNTAIN

ISSUE DATE : FEBRUARY 2003

TITLE: 2003 HP REPLANT

UNIT No: 1

REVISION: A FEBRUARY 2003

APPROVAL REFERENCE

A = Approval required

C = Copy of document required

E = Examine cert./document

ABBREVIATIONS :-

H = Hold point

I = In-process check

N = Notify readiness for test

R = Review required

S = Surveillance

X = Originator of Inspn/document

NOTE : Prior to commencement of any section of the following Field Quality Plan, reference documents and acceptance standards, identified in columns 6 & 7, must be verified as the current issues.

NO.	COMPONENT/ACTIVITY	REQUIREMENT	TYPE OF CHECK	QUANTITY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	RECORD FORMAT	AGENCY				REMARKS	DWG REV
								SUB	ALST	CUST			
1	TURBINE CHECKLIST (STRIPDOWN AND REBUILD)	CLEARANCE CHECKS	MEASUREMENT	100%	N/A	MACHINE DRAWINGS	CHECKLIST REF No. 1175		X I S A	C		SECTIONS 2 to 9	

IP7006904

CHECK SHEET ISSUE STATUS AND COMPLETION RECORD

CONTRACT	INTERMOUNTAIN	UNIT NO:	1	ST NO:	11246
CHECKLIST NO:	1175				
SECTION NO:	6	TITLE:	HP CYLINDER - REBUILD		

Sheet 1 of 2

PAGE NO	SHEET NO	DESCRIPTION	ISSUE	TS ENGR
6.1	HP20/001	HP Rotor bumping clearance and axial datums	A	
6.2	HP20/026	HP Inner cylinder to rotor axial datums - unboxed	A	
6.3	HP20/027	HP Inner & Outer cylinder/rotor radial datums - unboxed	A	
6.4	HP20/009	HP Inner cylinder/rotor radial datums - boxed	A	
6.5	HP20/018	HP/IP Rotor to casing vertical datums unboxed	A	
6.6	HP20/013	HP rotor to Front pedestal axial datum	A	
6.7	PD15/008	HP Rotor to Thrust pedestal axial datum	A	
6.8/6.9	HP11/036	HP Disc & diaphragm axial & radial clearances (2 Sheets)	A	
6.10	HP11/035	HP Rotor spill strip to shrouding clearances	A	
6.11	HP02/005	HP Shaft end gland clearances - box A Front	A	
6.12	HP02/005	HP Exhaust shaft gland clearances - box B Front	A	
6.13	HP02/005	HP Shaft cylinder gland clearances - box D Rear	A	
6.14	HP02/005	HP Shaft end gland clearances - box E Rear	A	
6.15	HP/CL2	HP Shaft gland box axial clearances - FRONT	A	
6.16	HP/CL1	HP Shaft gland box axial clearances - REAR	A	
6.17	HP05/007	HP Exhaust end gland 'B' carrier key clearances	A	
6.18	HP08/001	HP Gland box to cylinder half joint steps - boxes A, B, C & E	A	
6.19	HP24/028	HP Inner/Outer cyl half joint steps, axial & side datums	A	
6.20/6.22	PD09/002	HP Rotor radial bore readings	A	
6.23	HP02/011	HP Gland bore and joint gap checks - boxes A, B, D & E	A	
6.24	HP01/001	HP Shaft Gland Ring Butt Clearances	A	

CHECK SHEET ISSUE STATUS AND COMPLETION RECORD

CONTRACT	INTERMOUNTAIN	UNIT NO:	1	ST NO:	11246
CHECKLIST NO:	1175				
SECTION NO:	6	TITLE:	HP CYLINDER - REBUILD		

Sheet 2 of 2

PAGE NO	SHEET NO	DESCRIPTION	ISSUE	TS ENGR
6.25	HP/CL3	HP Gland axial & radial mismatch - boxes A, D & E	A	
6.26	HP24/024	HP Outer cylinder joint gaps unbolted	A	
6.27	HP27/015	HP Steam inlet clearances	A	
6.28	HP27/019	HP Heater connection assembly	A	
6.29	HP27/020	HP Heater connection flange clearances	A	
6.30	HP27/019	HP leak off for IP rotor cooling connection assembly	A	
6.31-32	HP26/008	HP Inner to outer cylinder key clearances (2 Sheets)	A	
6.33	HP28/002	HP inner to outer cylinder baffle clearances	A	
6.34-35	HP23/010	HP Cylinder Thrust key and paw grip clearances (2 Shts)	A	
6.36	HP23/005	HP Cylinder Thrust key & support packer thicknesses	A	
6.37	HP21/003	HP Cylinder to pedestal centre line key clearances	A	
6.38	HP25/001	HP Cylinder component bolts - torque settings	A	
6.39-40	HP25/002	Controlled tightening of HP Inner cylinder bolts (2 Sheets)	A	
6.41-43	HP16/007	HP outer shell distortion correction factors - laser measurement	A	
6.44	HP18/001	HP Inner cylinder final box-up checks	A	
6.45	HP18/001	HP Outer cylinder final box-up checks	A	

Title **HP/IP ROTOR BUMPING CLEARANCE & AXIAL COLD DATUMS**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**
 Site Issue **A** Date **21/3/02** Checked **BI** Check List No. **1175**
 Taken by **MLS/BG** Date **19/3/03** Supervisor **MLS/BG** Date **19/3/03** Approved Date

Readings in inches

SHAFT IDENTIFICATION No.:	RF 113218
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CYLINDER CONDITION	UNBOXED	BOXED (inner cyl + B gland only available)
DATUM WITH ROTOR HARD TO FRONT	9.808	9.660
ROTOR EXPANDING CLEARANCE (DESIGN .175)	0.152	0.300
DATUM WITH ROTOR HARD TO REAR	10.082	10.166
ROTOR CONTRACTING CLEARANCE (DESIGN .165)	0.122	0.206
TOTAL FLOAT (DESIGN .340)	0.274	0.506

Contacting:- Unboxed - To the REAR - Gland ring D4 To the FRONT - Gland ring E2
 Boxed - inner cylinder Inlet gland 'C' expanding and contracting

EXTERNAL COLD DATUMS

FRONT-END THROWER TO GLAND	L.H.S.	N/A
	R.H.S.	N/A
REAR-END THROWER TO GLAND	L.H.S.	N/A
	R.H.S.	N/A

DISTANCE BETWEEN THE BACK FACE OF THE HP REAR COUPLING AND THE MIDDLE STANDARD, AT THE T2 BEARING HOUSING AXIAL LOCATION IN THE MIDDLE STANDARD	9.960 * (build working datum - see below for FINAL datum)
POSITION AT WHICH READING WAS TAKEN	LHS - just below half joint

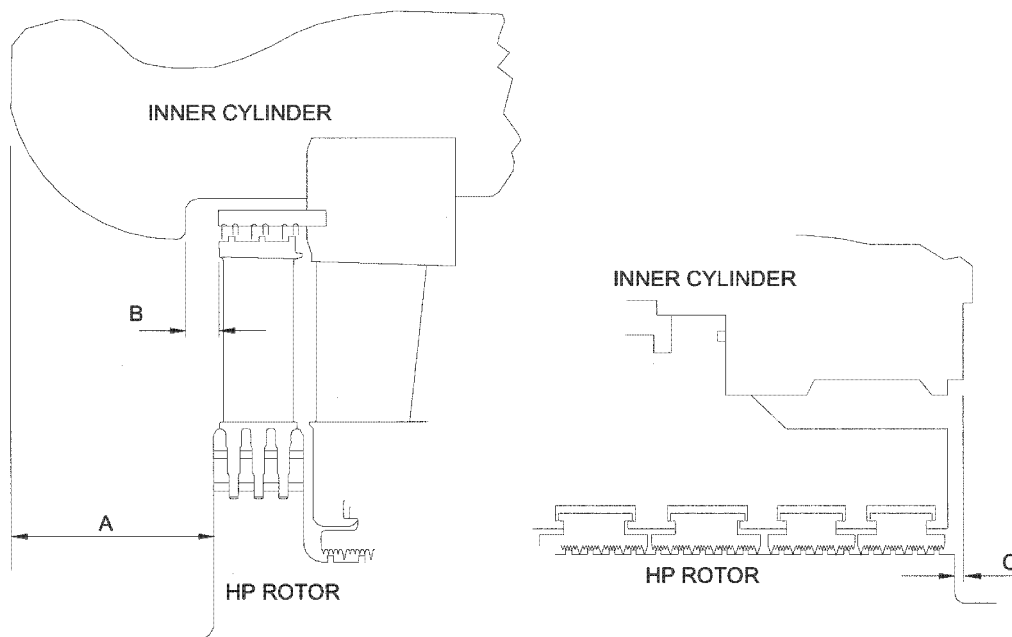
* FINAL AXIAL DATUM AFTER ADJUSTMENT FOR THE IP FINAL POSITION = **10.086"** (24/3/2003)

Title HP INNER CYLINDER TO ROTOR AXIAL DATUMS - UNBOXED

Contract INTERMOUNTAIN Unit No. 1 Serial No. 11246

Site Issue A Date 12/02/02 Checked BI Check List No. 1175

Taken by B Grierson Date 9/3/03 Supervisor Date Approved Date

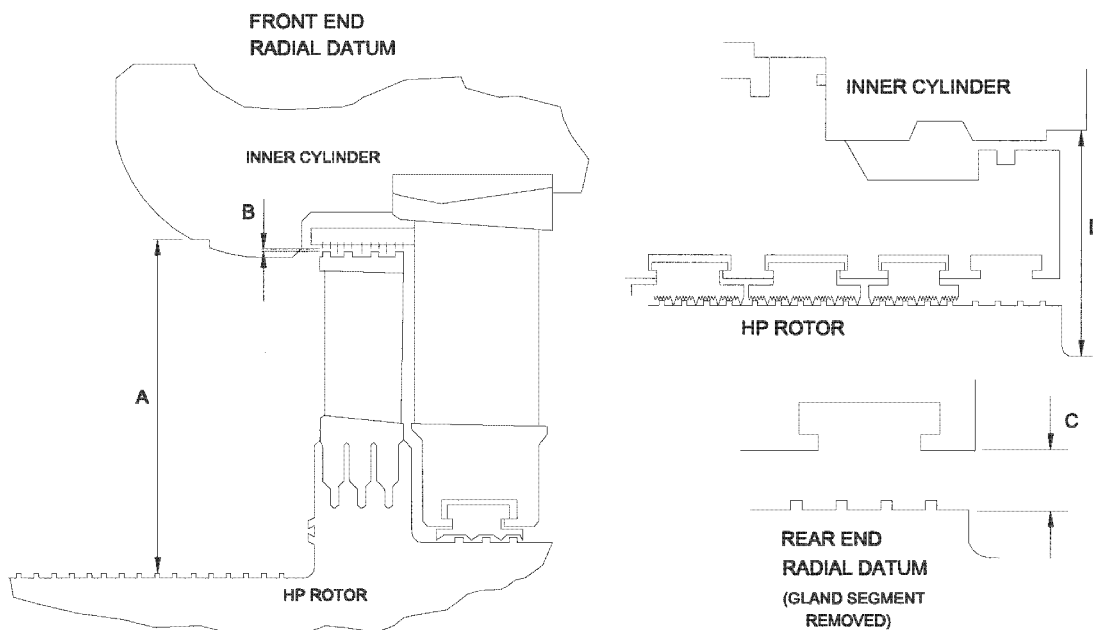


Readings in inches

	FRONT A		FRONT B		REAR C	
	SHOP	SITE	SHOP	SITE	SHOP	SITE
LHS	---	No access at site	.507	.510	1.057	1.055
BOTT	---		---	N/R	---	N/R
RHS	---		.504	.506	1.055	1.051

Title **HP INNER CYLINDER/ROTOR RADIAL DATUMS - UNBOXED**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date	12/02/02	Checked	BI	Check List No.
Taken by	B Grierson	Date	9/3/03	Supervisor		Date
				Date	Approved	Date



Readings in inches

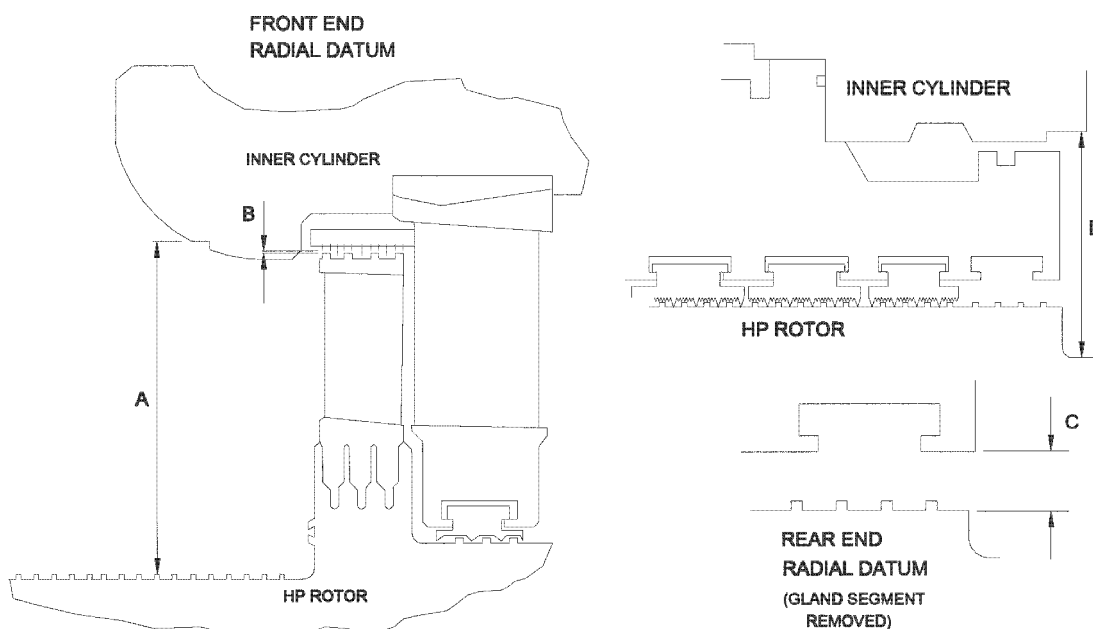
	FRONT A		FRONT B		REAR C		REAR D	
	SHOP	SITE	SHOP	SITE	SHOP	SITE	SHOP	SITE
LHS	---	No access at site	0.034	0.036	.707	.705	6.003	6.001
BOTT	---		0.028	No access	.700	No access	No access	No access
RHS	---		0.034	0.032	.705	.708	6.002	6.004

Title **HP INNER CYLINDER/ROTOR RADIAL DATUMS - BOXED**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **12/02/02** Checked **B** Check List No. **1175**

Taken by **B Grierson** Date **20/3/03** Supervisor Date Approved Date

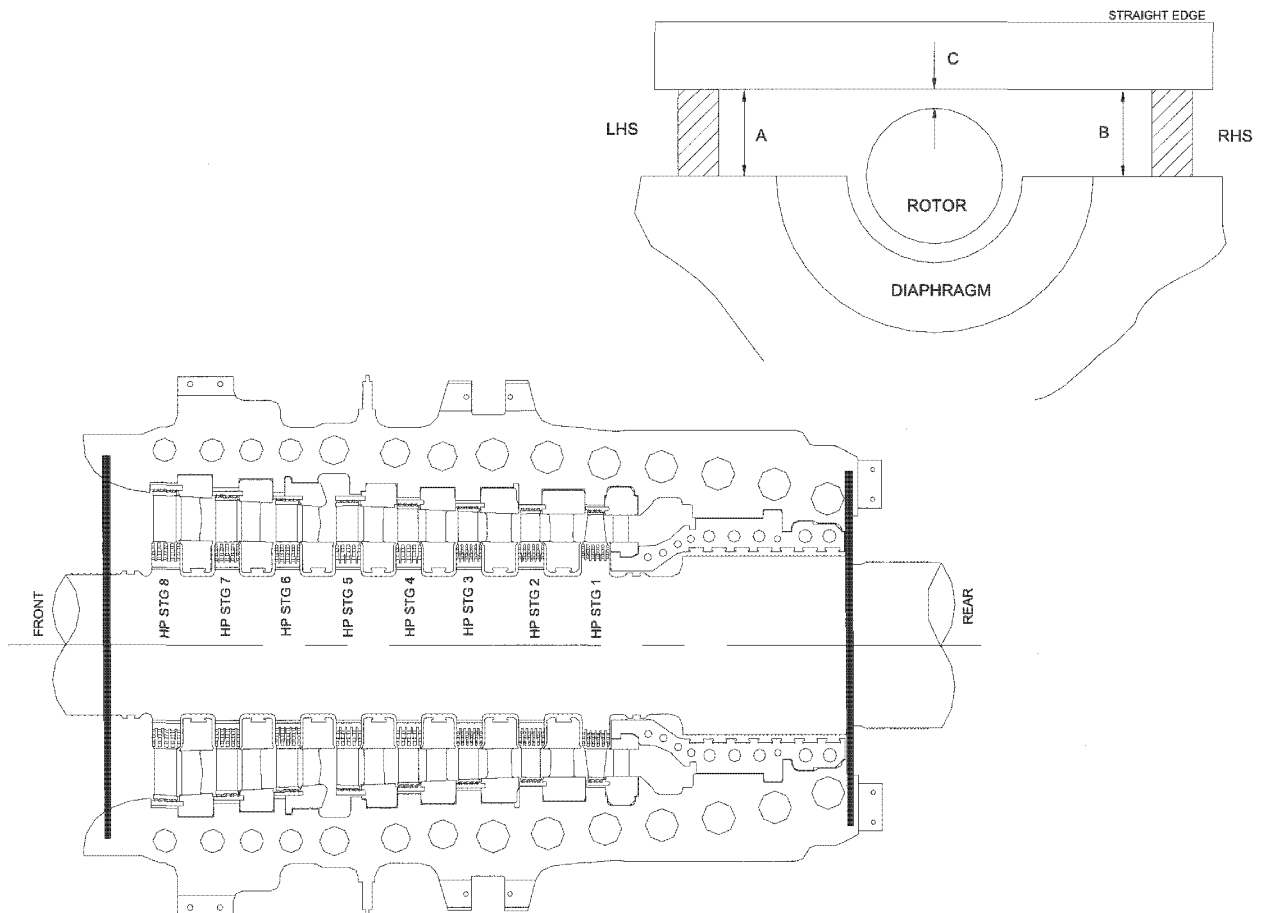


Readings in inches

	FRONT A		FRONT B		REAR C		REAR D	
	SHOP	SITE	SHOP	SITE	SHOP	SITE	SHOP	SITE
LHS (BOTT)	---	No access	---	No access	---	Not applicable	6.003	6.001
BOTT	---		---		---		---	No access
RHS (BOTT)	---		---		---		6.002	6.004
TOP	---		---		---		6.012	6.006

Title **HP/IP ROTOR TO CASING VERTICAL DATUMS - UNBOXED**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date	12/02/02	Checked	BI	Check List No
Taken	IPSC	Date	19/3/03	Supervisor	M Storey	Date
				Approved		



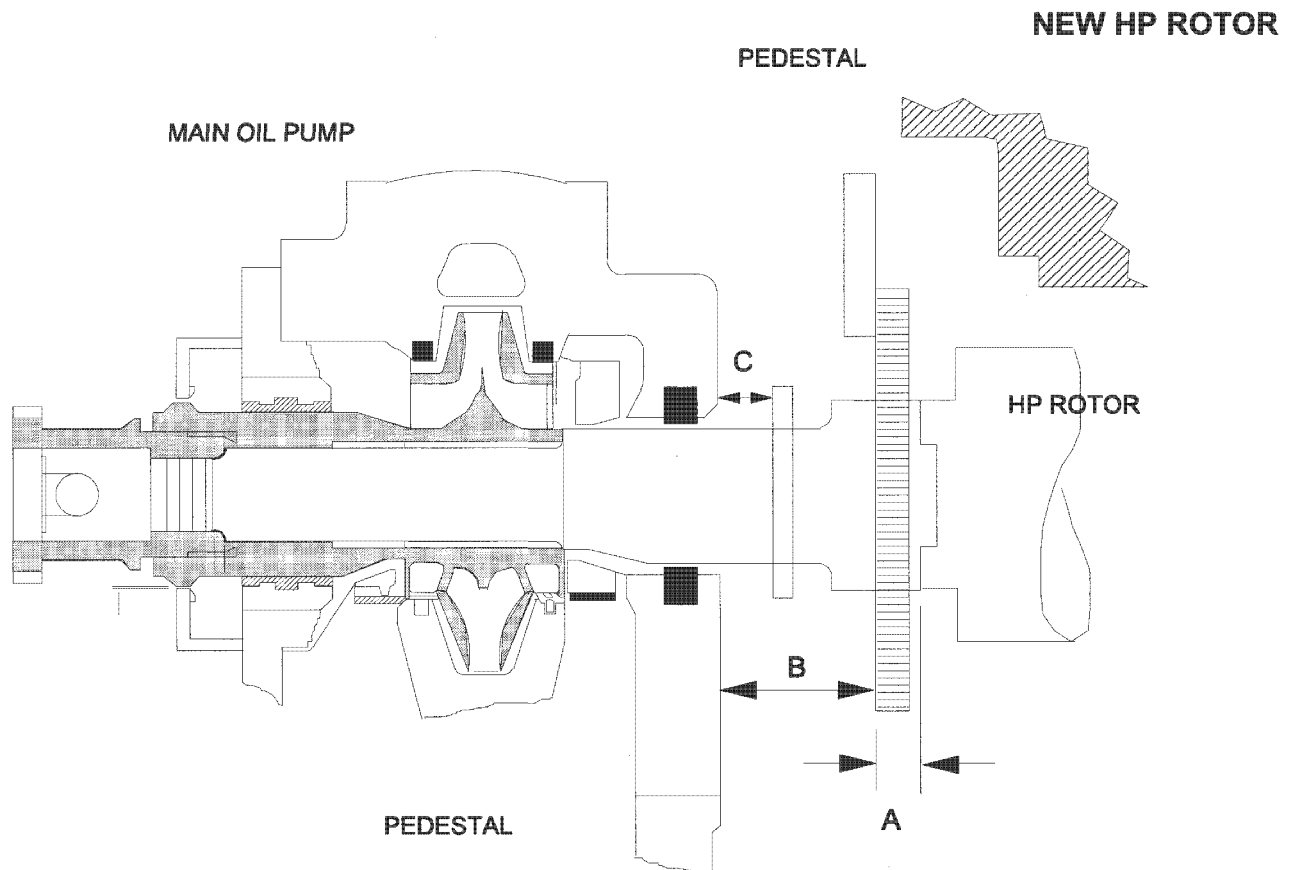
Note: Vertical datum measurement taken with rotor / gland bottom build clearances established and without any compensation for bolt up. Readings are with the outer cylinder on Build keys

POSITION	A	B	C	*Works build adjusted	Difference Site/Works	Tops off/ Tops on Change
HP DIAPHRAGM St. 8	13.812	13.8115	1.9545	2.068	2.069	-0.008
HP INLET GLAND	14.813	14.8135	1.326	1.335	1.326	+ 0.005

* Works build figures adjusted for difference in straight edge support block dimensions.
Vertical error corrected by later adjustment on running keys

Title ROTOR TO FRONT PEDESTAL AXIAL DATUM

Contract INTERMOUNTAIN Unit No. 1 Serial No. 11246
 Site Issue A Date 17/02/02 Checked BI Check List No. 1175
 Taken by W Falconer Date 26/3/03 Supervisor Date Approved Date



ROTOR IN COLD SET POSITION PUSHED TO FRONT

Readings in inches

DATUM		POSITION
A	N/A	
B	8.111	Pump casing to Wheel - LHS just below half joint
C	1.138	Pump casing to collar - LHS just below half joint

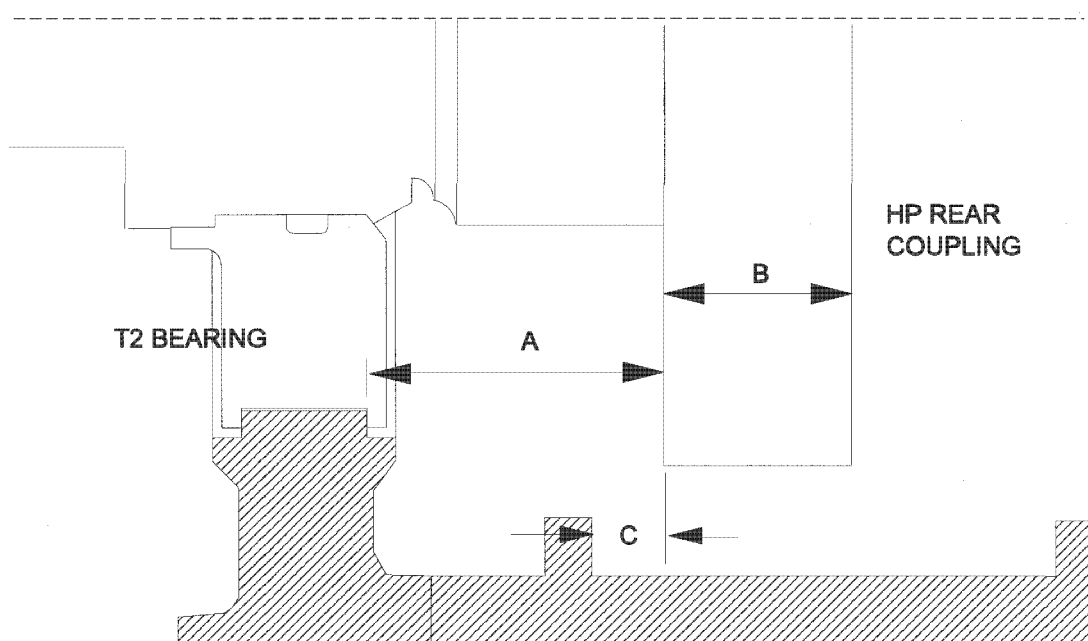
6 - HP REBUILD

IP7006912

Title **HP ROTOR TO THRUST PEDESTAL AXIAL DATUM**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI	Check List No.
Taken by	Date	Supervisor	Date	Approved	Date	

HP ROTOR AXIAL DATUM IN THRUST PEDESTAL



ROTORS IN COLD SET POSITION PUSHED TO THE **FRONT**

Readings in inches

DATUM	NEW ROTOR	POSITION
A	Working datum 9.960 FINAL datum 10.086	LHS
B	N/R	N/A
C	N/R	

6 - HP REBUILD

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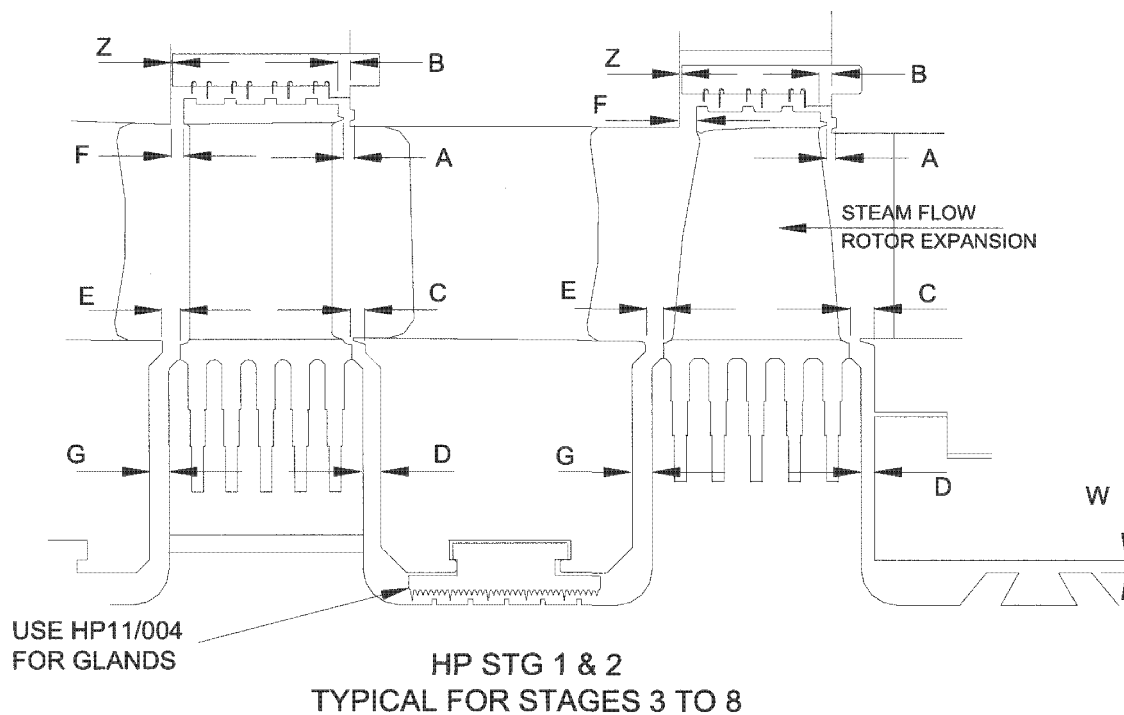
Title **HP DIAPHRAGM & WHEEL CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by _____ Date _____ Supervisor _____ Date _____ Approved _____ Date _____

REF DRAWING : R277/1338 REV B



ALL AXIAL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.
MINIMUM CLEARANCE TO BE RECORDED.

Title **H.P. DIAPHRAGM & WHEEL CLEARANCES**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI	Check List No.
Taken by	As works build	Date	Supervisor	Date	Approved	Date

REF DRAWING: R277/1338 REV B

ROTOR AXIAL DATUM = 9.960
(HP Coupling to T2 Bearing)

(F= Front End, R= Rear End)

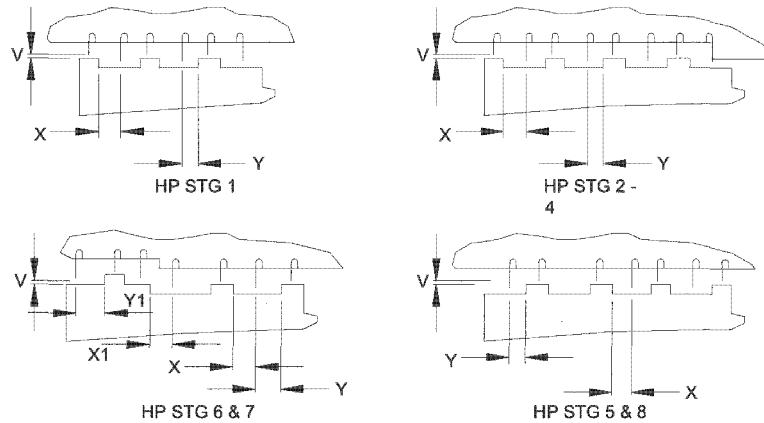
Readings in inches

BLADING STAGE		8	7	6	5	4	3	2	1
A	DESIGN	.224				.221	.213	.197	.185
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8						
		RHS							
B	DESIGN	.264				.260	.252	.236	.224
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8						
		RHS							
C	DESIGN	.268	.287	.299	.295	.287	.283	.213	
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8						
		RHS							
D	DESIGN	.343	.366	.378	.382	.374	.276		
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8						
		RHS							
E	DESIGN	.634	.496	.484	.472	.453	.429	.406	
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8						
		RHS							
F	DESIGN	.500	.496	.484	---	.453	.429	.406	
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8						
		RHS							
G	DESIGN	.823	.547	.524	.504	.480	.457		
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8						
		RHS							
Z	DESIGN	.039	1.496	.039					
	ACTUAL	LHS	SEE WORKS BUILD SECTION 5 PAGE 8						
		RHS							
W	DESIGN	'B' GLAND DESIGN = .427				'C' GLAND DESIGN = .315			
	ACTUAL	LHS	Not measured				SEE SECTION 5.8		
		RHS	"				"		

Title **HP ROTOR SPILL STRIP TO SHROUDING CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**
 Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**
 Taken by As works build Date Supervisor Date Approved Date

REF DRAWING: R277/1338
 REV B



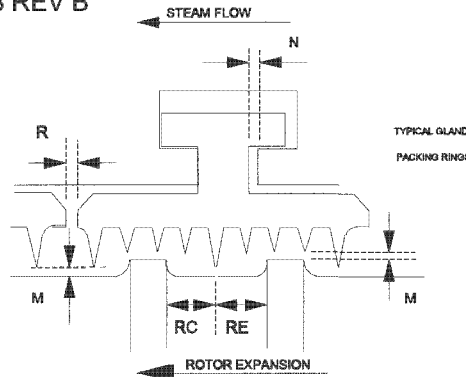
BLADING STAGE			8	7	6	5	4	3	2	1
V	TOP	DES	.031	.030	.028	.028	.028	.028	.043	.028
		ACT	See Section 5 Page 9							
	BOT	DES	.031	.030	.028	.028	.028	.028	.043	.028
		ACT	See Section 5 Page 9							
	DESIGN		.031	.030	.028	.028	.028	.028	.043	.028
	LHS	ACT	See Section 5 Page 9							
	RHS	ACT	"							
X	DESIGN		.244	.315	.354	.240	.240	.240	.220	.228
	ACTUAL	LHS	See Section 5 Page 9							
		RHS	"							
X1	DESIGN		---	.276	.236	---	---	---	---	---
	ACTUAL	LHS	---	See Section 5 Page 9		---	---	---	---	---
		RHS	---			---	---	---	---	---
Y	DESIGN		.476	.563	.610	.429	.421	.421	.385	.441
	ACTUAL	LHS	See Section 5 Page 9							
		RHS	"							
Y1	DESIGN		---	.488	.437	---	---	---	---	---
	ACTUAL	LHS	---	See Section 5 Page 9		---	---	---	---	---
		RHS	---	"		---	---	---	---	---

Title HP SHAFT END GLAND CLEARANCES - BOX A FRONT

Contract INTERMOUNTAIN Unit No. 1 Serial No. 11246
 Site Issue A Date 17/02/02 Checked BI Check List No. 1175
 Taken by BG/MLS Date March 03 Supervisor BG/MLS Date Mar 03 Approved Date

REF DRAWING :- R277/1338 REV B

ROTOR AXIAL DATUM = 9.960
 (HP Coupling to T2 Bearing)



ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End)

RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

Readings in inches

GLAND RING NO.			A1 F	A2 R
RE (L)	DESIGN		.550	.550
	LHS		0.595	0.564
	RHS		0.595	0.564
RC (O)	DESIGN		.290	.290
	LHS		0.264	0.280
	RHS		0.248	0.280
M	TOP	DES	.025	.025
		ACT	.038*	.037*
	BOT	DES	.025	.025
		ACT	.032**	.032**
	LHS	DES	.025	.025
		ACT	.020	.021
	RHS	DES	.025	.025
		ACT	.024	.029
N	DESIGN		-----	-----
	LHS			
	RHS			
R	DESIGN		-----	-----
	LHS			
	RHS			

* From top lead (uncorrected)

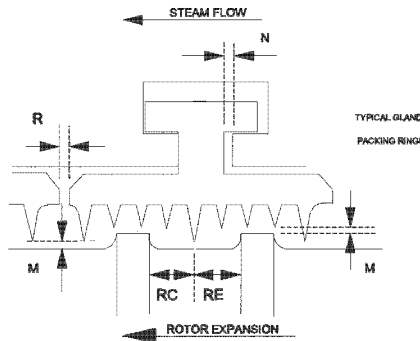
** From tape-on-rotor check (uncorrected)

Title **HP EXHAUST SHAFT GLAND CLEARANCES - BOX B FRONT**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI	Check List No.
Taken by	BG/MLS		Date	March 03	Supervisor	BG/MLS
			Date	Mar 03	Approved	

REF DRAWING :- R277/1338 REV B

ROTOR AXIAL DATUM = 9.960
(HP Coupling to T2 Bearing)



ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End)

RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

Readings in inches

GLAND RING NO.			B1	B2	B3	B4	B5
RE (L)	DESIGN		.550	.550	.550	.550	.550
	LHS		0.564	0.564	0.579	0.579	0.579
	RHS		0.579	0.564	0.579	0.579	0.579
RC (O)	DESIGN		.290	.290	.290	.290	.290
	LHS		0.280	0.280	0.249	0.249	0.249
	RHS		0.280	0.264	0.249	0.249	0.249
M	TOP	DES	.020	.020	.020	.020	.020
		ACT	.022*	.023*	.023*	.024*	.023*
	BOT	DES	.020	.020	.020	.020	.020
		ACT	.018	.017	.016	.016	.017
	LHS	DES	.020	.020	.020	.020	.020
		ACT	.016/.016	.015/.015	.015/.014	.012/.011	.011/.011
	RHS	DES	.020	.020	.020	.020	.020
		ACT	.019/.019	.021/.021	.023/.022	.021/.020	.020/.019
N	DESIGN		----	----	----	----	----
	RHS						
R	DESIGN		----	----	----	----	----
	LHS						
	RHS						

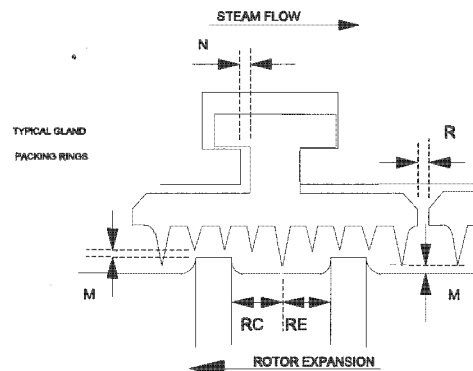
* Top lead minus nominal TO/TO shift allowance

Title **HP SHAFT CYLINDER GLAND CLEARANCES - BOX D REAR**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**
 Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**
 Taken by **MLS/BG** Date **March 03** Supervisor **MLS/ BG** Date **Mar 03** Approved Date

REF DRAWING :- R277/1338 REV B

ROTOR AXIAL DATUM = 9.960
 (HP Coupling to T2 Bearing)



ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End)

RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

Readings in inches

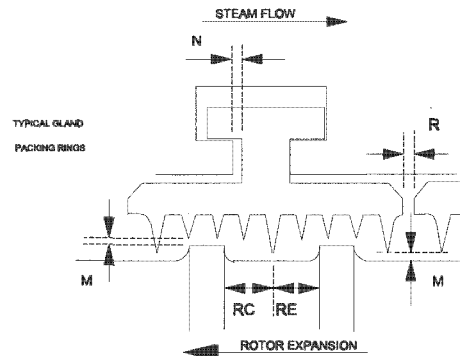
GLAND RING NO.			D1	D2	D3	D4
RE (L)	DESIGN		.180	.180	.180	.180
	LHS		.165	.180	.165	.195
	RHS		.170	.193	.180	.182
RC (O)	DESIGN		.170	.170	.170	.170
	LHS		.135	.129	.135	.120
	RHS		.142	.130	.143	.135
M	TOP	DES	.020	.020	.020	.020
		ACT	-	-	-	-
	BOT	DES	.020	.020	.020	.020
		ACT	.025	.030	.025	.025
	LHS	DES	.020	.020	.020	.020
		ACT	.020/.020	.019/.019	.020/.020	.016/.016
	RHS	DES	.020	.020	.020	.020
		ACT	.018/.019	.017/.017	.020/.018	.023/.023
N	DESIGN		---	---	---	---
	LHS					
	RHS					
R	DESIGN		---	---	---	---
	LHS					
	RHS					

Title **HP SHAFT END GLAND CLEARANCES - BOX E REAR**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI	Check List No.
Taken by	MLS/BG		Date	March 03		Supervisor
	MLS/BG		Date	Mar 03		Approved
						Date

REF DRAWING :- R277/1338 REV B

ROTOR AXIAL DATUM = 9.960
(HP Coupling to T2 Bearing)



ALL CLEARANCES TAKEN WITH ROTOR IN COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

(F= Front End, R= Rear End)

RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

Readings in inches

GLAND RING NO.			E1	E2
RE (L)	DESIGN		.175	.175
	LHS		.157	.157
	RHS		.157	.157
RC (O)	DESIGN		.165	.165
	LHS		.186	.186
	RHS		.186	.186
M	TOP	DES	.025	.025
		ACT	.047*	.044*
	BOT	DES	.025	.025
		ACT	.020**	.020**
	LHS	DES	.025	.025
		ACT	.025	.025
	RHS	DES	.025	.025
		ACT	.023	.025
N	DESIGN			
	LHS			
	RHS			
R	DESIGN			
	LHS			
	RHS			

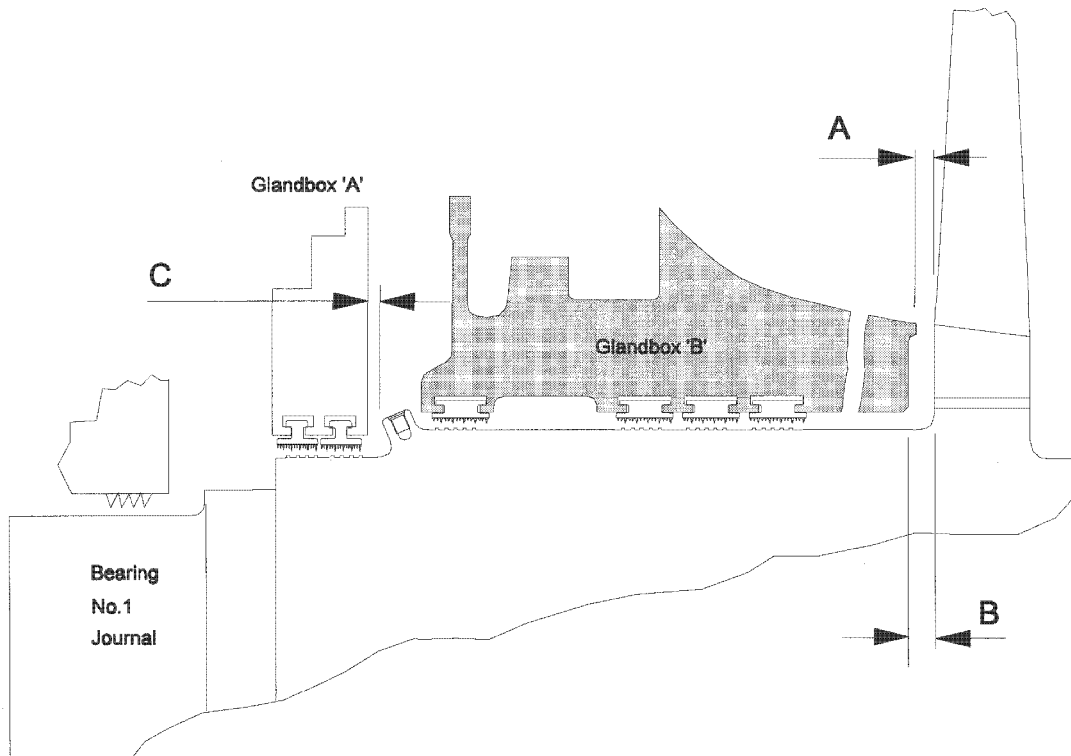
* Top lead (corrected for TO/TO shift)

** From tape-on-rotor checks (corrected for TO/TO shift)

Title **HP SHAFT GLAND BOX AXIAL CLEARANCES - FRONT**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI	Check List No.
Taken by	B Grierson		Date	20/3/03	Supervisor	
			Date		Approved	Date

REF DRAWING :- R217/A0/1338 Rev. B



ROTOR AXIAL DATUM = 9.960
(HP Coupling to T2 Bearing)
Readings in inches

ROTOR IN THE COLD SET POSITION PUSHED TO FRONT

POSITION	A (RE)	B (RE)	C (RE)	
DESIGN	.634	.823	.820	
LHS	.612	Not recorded	.782	
RHS	.607	Not recorded	.783	

RE = ROTOR EXPANDING CLEARANCE

RC = ROTOR CONTRACTING CLEARANCE

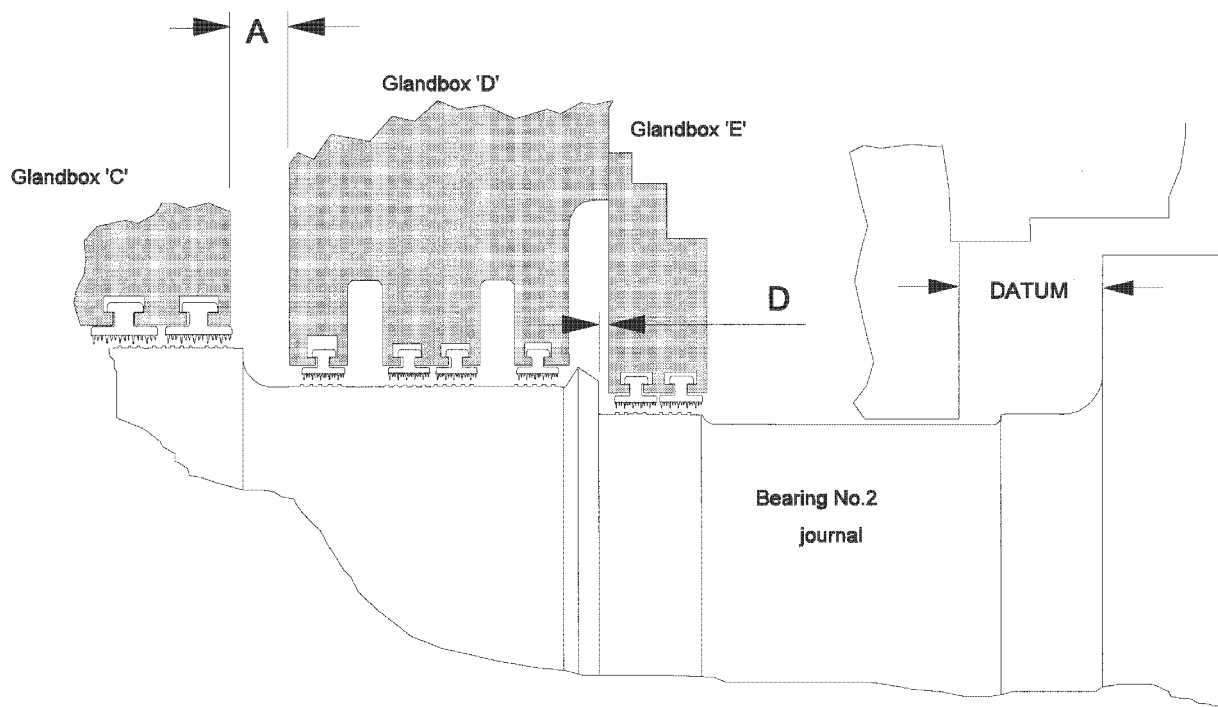
6 - HP REBUILD

IP7006921

Title **HP SHAFT GLAND BOX AXIAL CLEARANCES - REAR**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**
 Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**
 Taken by **B Grierson** Date **20/3/03** Supervisor **BG** Date **20/3/03** Approved Date

REF DRAWING :- R217/A0/1338 Rev. B



ROTOR AXIAL DATUM = 9.960

(HP Coupling to T2 Bearing)

ROTOR IN THE COLD SET POSITION PUSHED TO FRONT

Readings in inches

POSITION	A	B (RC)	C (RE)	D (RC)
DESIGN		N/A	N/A	1.054
LHS	3.250	---	---	1.091
RHS	3.250	---	---	1.097

RE = ROTOR EXPANDING CLEARANCE

RC = ROTOR CONTRACTING CLEARANCE

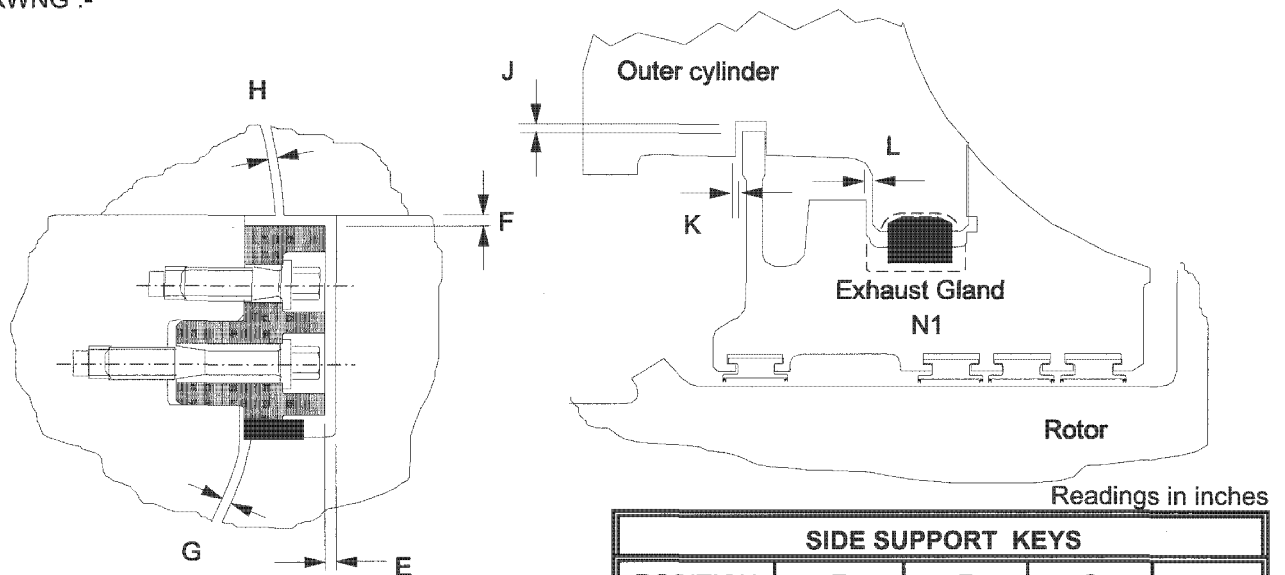
6 - HP REBUILD

IP7006922

Title **HP EXHAUST END GLAND 'B' CARRIER KEY CLEARANCES**

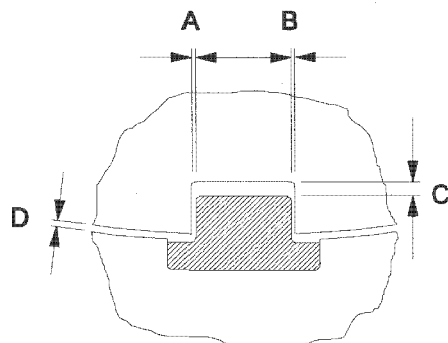
Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**
 Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**
 Taken by B Grierson Date 18/3/03 Supervisor BG Date 18/3/03 Approved Date

REF DRWNG :-



Side support key

SIDE SUPPORT KEYS				
POSITION	E	F	G	H
DESIGN	---	---	---	---
LHS	.145	-.003	.127	NR
RHS	.062	-.003	.118	NR



Bottom Centralising key

BOTTOM CENTRALISING KEY			
POSITION	A + B	C	D
DESIGN	---	---	---
BOTTOM	.002	NR	NR

AXIAL LOCATION CLEARANCES						
POS	J		K		L	
DES	---		---		---	
	*	*	LHT	*	LH Top	*
LHS	*	*	RHT	*	RH Top	*
C/L	*	*	LHB	*	LH Bot	*
RHS	*	*	RHB	*	RH Bot	*

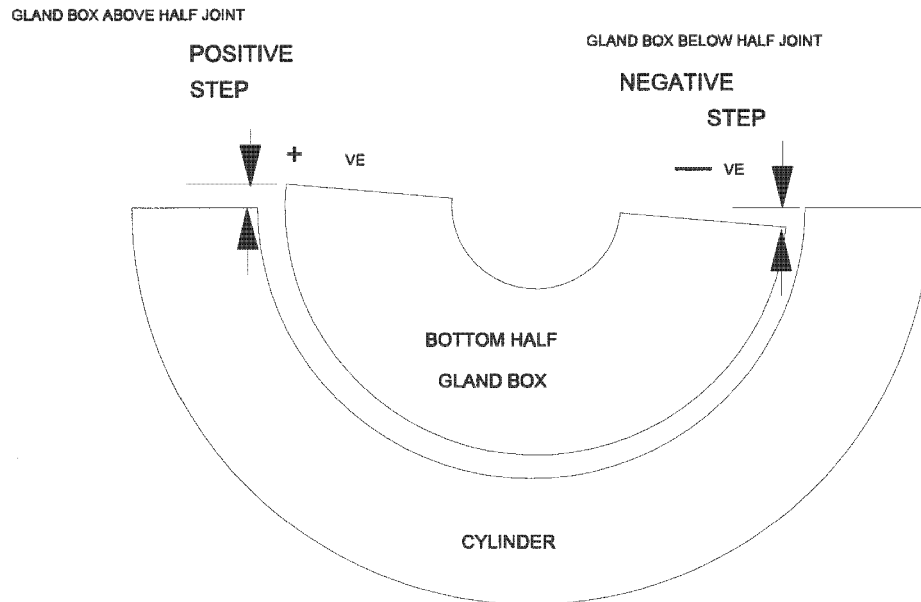
* Original packing head - no change

6 - HP REBUILD

IP7006923

Title **HP GLAND BOX TO OUTER CYLINDER HALF JOINT STEPS**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**
 Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**
 Taken by **IPSC** Date **March 03** Supervisor **BG/MLS** Date **Approved** Date



POSITION AT WHICH READINGS ARE TAKEN TO BE MARKED 'X'

Readings in inches

	BOLT ON GLAND BOX A FRONT CORNER	BOLT ON GLAND BOX A REAR CORNER	EXHAUST GLAND BOX B FRONT CORNER	EXHAUST GLAND BOX B REAR CORNER	BOLT ON GLAND BOX E FRONT CORNER	BOLT ON GLAND BOX E REAR CORNER
LHS	-0.010	N/A	+0.003	-0.001	N/A	+0.028
RHS	+0.005	N/A	+0.001	-0.000	N/A	-0.024

NOTE + SIGN TO INDICATE BUSH PROUD OF CYLINDER HALF JOINT
 - SIGN TO INDICATE BUSH BELOW CYLINDER HALF JOINT.

Title **HP INNER/OUTER CYL HALF JOINT STEPS, AXIAL & SIDE DATUMS**

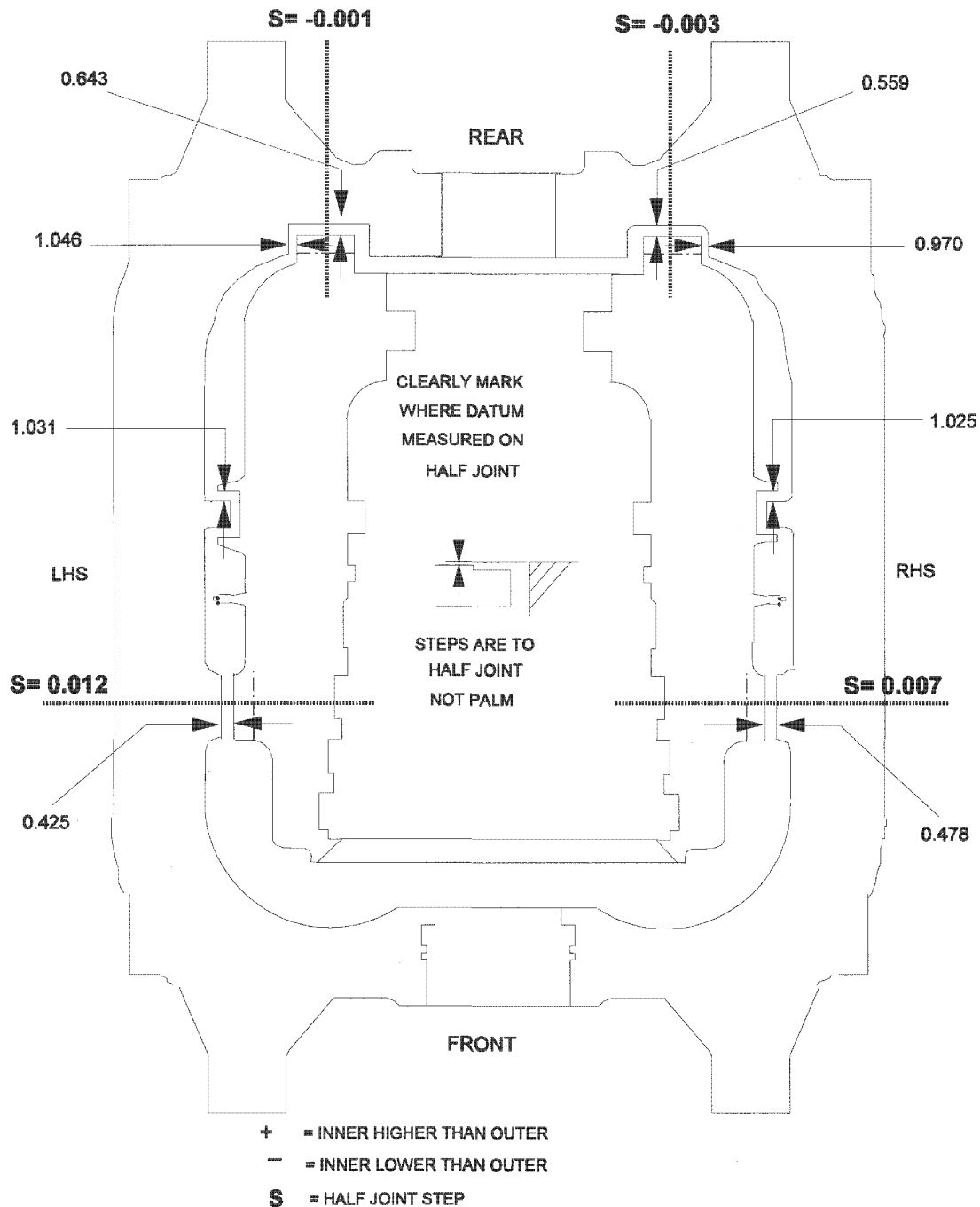
Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by **IPSC** Date **9/3/03** Supervisor **M Storey** Date **9/3/03** Approved _____ Date _____

Readings X 0.001"

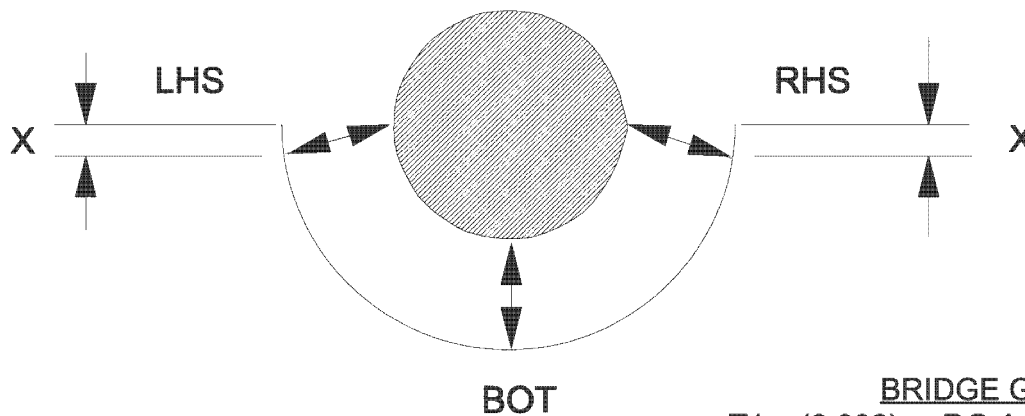
ROTOR / T2 AXIAL DATUM 9.952" (Note Final axial datum selected = 9.960")



6 - HP REBUILD

Title HP ROTOR POSIT. RADIAL CHKS - ON BUILDING KEYS UNBOXED

Contract INTERMOUNTAIN Unit No. 1 Serial No. 11246
 Site Issue A Date 12/02/02 Checked BI Check List No. 1175
 Taken by IPSC Date 17/3/03 Supervisor MLS Date 17-21 Mar Approved Date



BRIDGE GAUGE

T1 (8.002) BG 1.511 (8.004)
 T2 (8.001) BG 0.464 (8.003)

Bridge leg heights from standard half joint in brackets

DIMENSION X = FOR ALL SIDE DATUMS

Type Stamp Identification Letter on the Half Joints, in line with, and close to, the bore being measured from.

Readings in inches

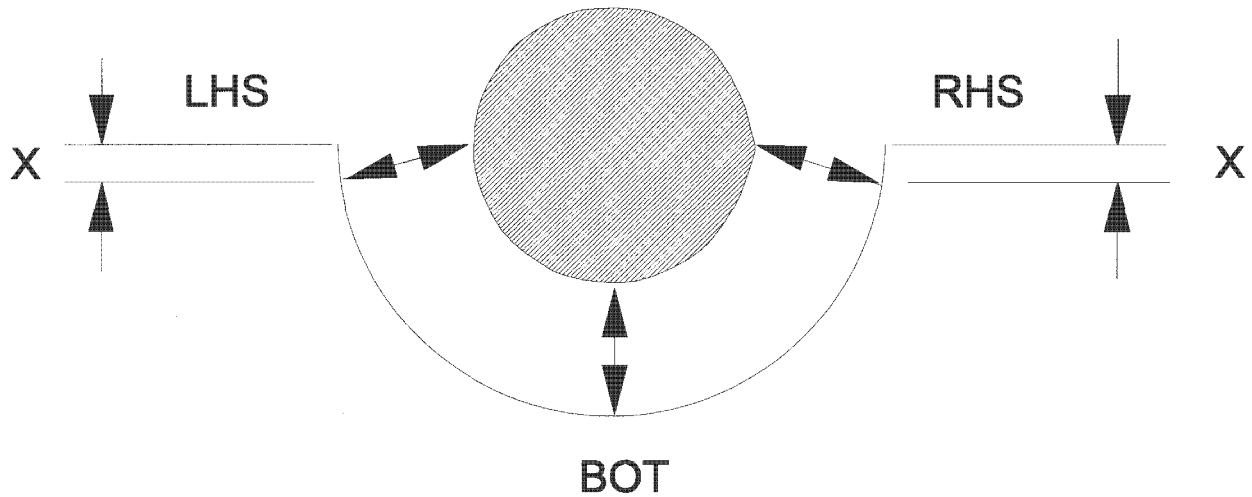
DATUM POSITION		UNBOXED DATUMS- ON BUILD KEYS - Rotor centred in brgs			COMMENTS
		LHS	BOT/TOP	RHS	
T1 PEDESTAL BORE		7.657	6.539	7.642	
FRONT BOLT-ON GLAND- SEGMENT REMOVED		0.878	0.874	0.883	
CYLINDER BORE - FRONT	TOP HALF	N/A	N/A	N/A	
	BOTT HALF		---		
CYLINDER BORE - REAR	TOP HALF	N/A	N/A	N/A	
	BOTT HALF		---		
REAR BOLT-ON GLAND- SEGMENT REMOVED		0.8715	0.892	0.874	
T2 PEDESTAL BORE		10.003	10.046	10.004	

RECORD SHEET PD09/002

Page No. 6.21

Title HP ROTOR POSITION RADIAL- ON BUILDING KEYS BOXED

Contract INTERMOUNTAIN Unit No. 1 Serial No. 11246
 Site Issue A Date 12/02/02 Checked BI Check List No. 1175
 Taken by B Grierson Date 23/3/03 Supervisor Date Approved Date



DIMENSION X = FOR ALL SIDE DATUMS

Type Stamp Identification Letter on the Half Joints, in line with, and close to, the bore being measured from.

Readings in inches

DATUM POSITION		BOXED DATUMS- ON BUILD KEYS			COMMENTS
		LHS	BOT/TOP	RHS	
T1 PEDESTAL BORE		N/A	N/A	N/A	
FRONT BOLT-ON GLAND- SEGMENT REMOVED		0.881	N/R	0.885	
CYLINDER BORE - FRONT	TOP HALF	---	9.658	---	
	BOTT HALF	---	N/A	---	
CYLINDER BORE - REAR	TOP HALF	---	8.170	---	
	BOTT HALF	---	N/A	---	
REAR BOLT-ON GLAND- SEGMENT REMOVED		0.875	N/R	0.882	
T1 PEDESTAL BORE		N/A	N/A	N/A	

Rotor centred in bearings

6 - HP REBUILD

IP7006927

RECORD SHEET PD09/002

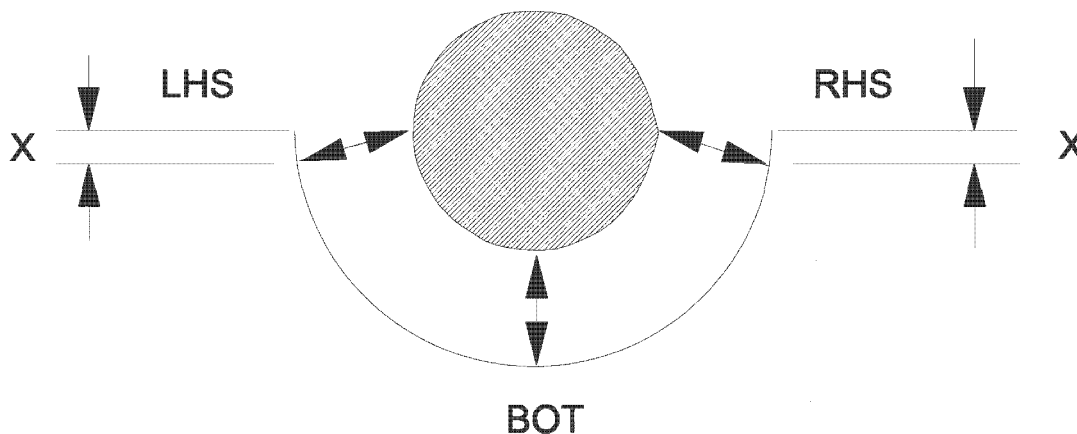
Page No. 6.22

Title HP ROTOR POSITION RADIAL- ON RUNNING KEYS BOXED

Contract INTERMOUNTAIN Unit No. 1 Serial No. 11246

Site Issue A Date 12/02/02 Checked BI Check List No. 1175

Taken by W Falconer Supervisor Date 26/3/03 Approved Date



DIMENSION X = FOR ALL SIDE DATUMS

Type Stamp Identification Letter on the Half Joints, in line with, and close to, the bore being measured from.

Readings in inches

DATUM POSITION		BOXED DATUMS- ON RUNNING KEYS			COMMENTS
		LHS	BOT/TOP	RHS	
T1 PEDESTAL BORE		N/A	N/A	N/A	
FRONT BOLT-ON GLAND- SEGMENT REMOVED		0.881	-	0.883	
CYLINDER BORE - FRONT	TOP HALF	-	9.6595	-	
	BOTT HALF	-	N/A	-	
CYLINDER BORE - REAR	TOP HALF	-	8.168	-	
	BOTT HALF	-	N/A	-	
REAR BOLT-ON GLAND- SEGMENT REMOVED		0.881	-	0.876	
T1 PEDESTAL BORE		N/A	N/A	N/A	

6 - HP REBUILD

IP7006928

RECORD SHEET **HP02/011**

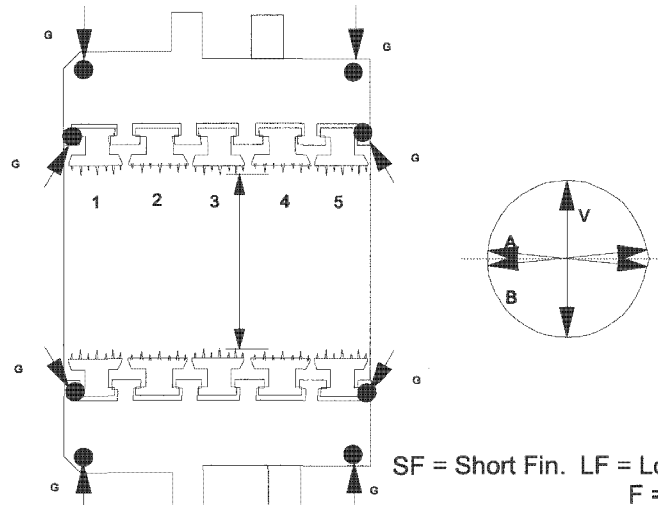
Page No. **6.23**

Title **HP STEAM GLAND BORE CHECKS - BOXES 'A','B', 'D' & 'E'**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by _____ Date _____ Supervisor _____ Date _____ Approved _____ Date _____



RING NO.	REQUD SIZE BOLTED	FIN	B0RE - X			HALF JOINT GAP - G (0.001")				
			VERT BORE - V	HORIZONTAL			LHS		RHS	
				A	B			OUTER	INNER	INNER
A1	N/A	Bore				FRONT				
A2	N/A	Bore				REAR				
B1	N/A	Bore								
B2	N/A	Bore	Not measured			FRONT				
B3	N/A	Bore				REAR				
B4	N/A	Bore								
D1	N/A	Bore								
D2	N/A	Bore	Not measured			FRONT				
D3	N/A	Bore				REAR				
D4	N/A	Bore								
E1	N/A	Bore				FRONT				
E2	N/A	Bore				REAR				

6 - HP REBUILD

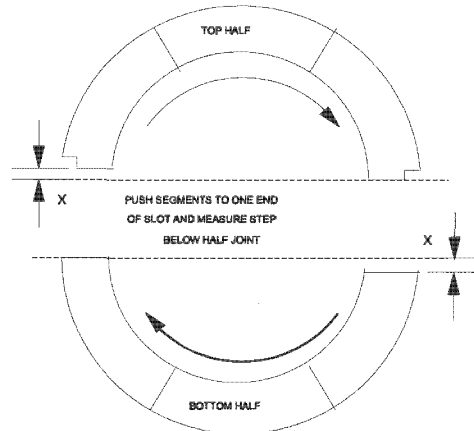
IP7006929

RECORD SHEET HP01/001

Page No. 6.24

Title **GLAND RING BUTT CLEARANCE FOR HP SHAFT GLANDS**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**
 Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**
 Taken by _____ Date _____ Supervisor _____ Date _____ Approved _____ Date _____



IRRESPECTIVE OF THE NUMBER OF SEGMENTS BUTT CLEARANCE 'X' IS THE CUMULATIVE TOTAL OF ALL SEGMENTS IN EACH HALF RING

Readings in inches

GLAND POSITION	RING NUMBER	BUTT CLEARANCE 'X'			
		DESIGN TOTAL	ACTUAL		
			TOP HALF	BOT HALF	TOTAL
'A'	1				
	2				
'B'	1				
	2				
	3				
	4				
	5				
'D'	1				
	2				
	3				
	4				
'E'	1				
	2				

6 - HP REBUILD

IP7006930

RECORD SHEET HP/CL3

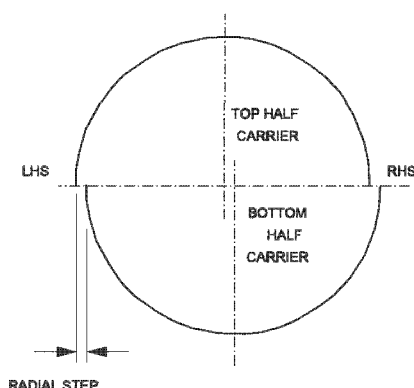
Page No. 6.25

Title **HP GLANDBOX AXIAL AND RADIAL MISMATCH - BOXES 'A', 'D' & 'E'**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by _____ Date _____ Supervisor _____ Date _____ Approved _____ Date _____

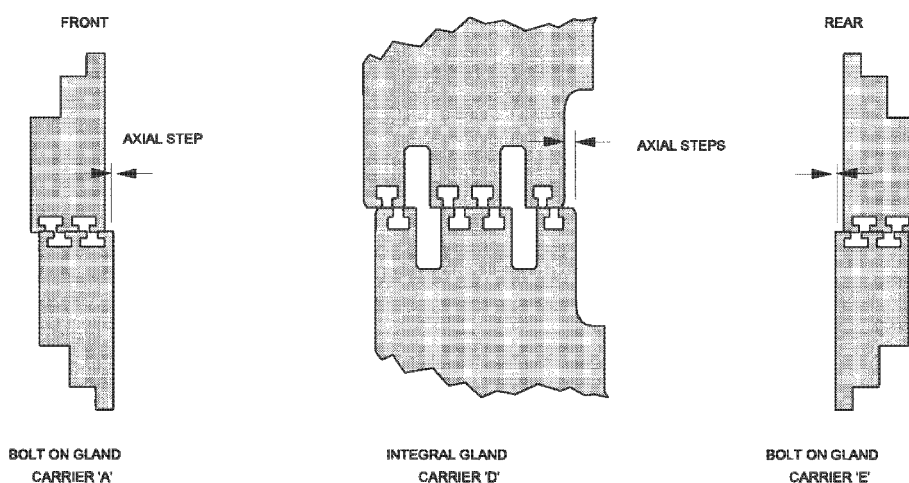


RADIAL OFFSET

Top half to the LHS read positive (+).
Top half to the RHS read negative(-).

AXIAL OFFSET

Top half to the front read positive (+)
Top half to the rear read negative(-).



Readings in inches

POSITION	RADIAL STEPS		AXIAL STEPS	
	LHS	RHS	LHS	RHS
Gland box 'A' Front	Refer to IPSC/Turbocare records		No significant mismatch	
Gland box 'A' Rear	"		"	
Gland box 'D' Front	"		"	
Gland box 'D' Rear	"		"	
Gland box 'E' Front	"		"	
Gland box 'E' Rear	"		"	

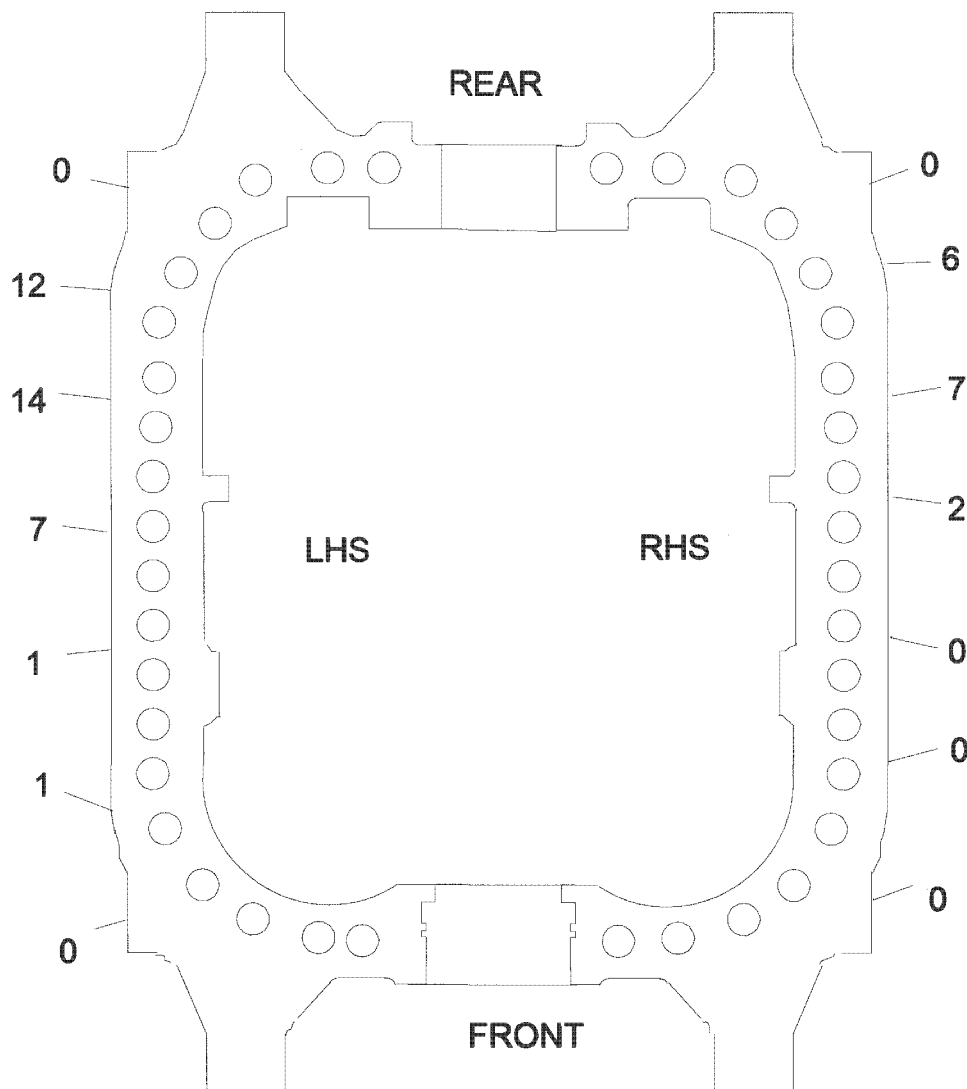
RECORD SHEET HP24/024

Page No. 6.26

Title HP OUTER CYLINDER JOINT GAPS - UNBOLTED

Contract	INTERMOUNTAIN	Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI
Check List No.	1175				
Taken by	IPSC	Date	3/3/03	Supervisor	MLS
Approved	Date				

Readings are 0.001"



6 - HP REBUILD

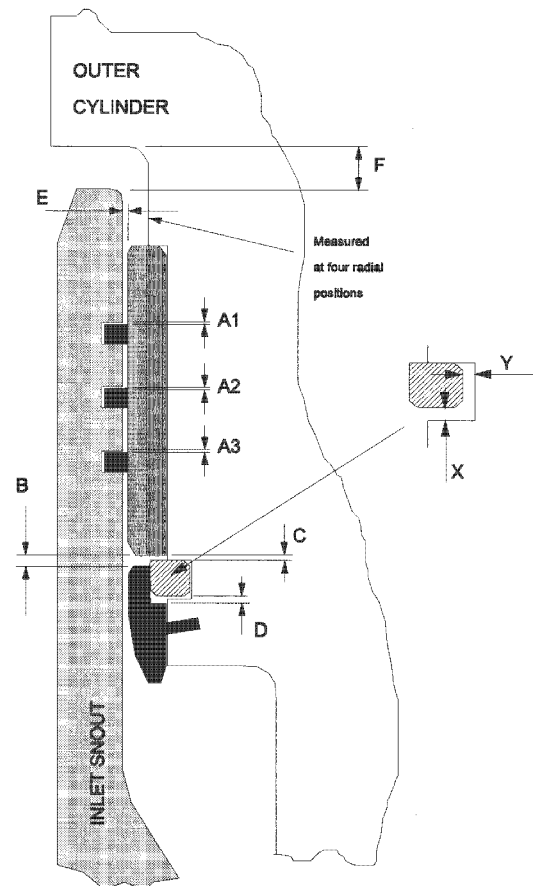
IP7006932

Title **HP STEAM INLETS CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**
 Site Issue **A** Date **13/3/02** Checked **BI** Check List No. **1175**
 Taken by **CFS** Date **16/3/03** Supervisor **M Storey** Date **16/3/03** Approved Date
 REF DRAWINGS :- R202/A0/5396 Rev. C, R202/A0/5387 Rev A

Readings in inches

		HP TURBINE INLETS			
POSITION	DESIGN	TOP LHS	TOP RHS	BOTT LHS	BOTT RHS
A1	.020/.027	.022	.020	.020	.021
A2	.020/.027	.021	.021	.020	.021
A3	.020/.027	.021	.021	.020	.021
B*	.035/.055	.048	.048	.039	.039
C*	.006/.016	.006	.006	.008	.009
D*	0.024/.040	.030	.030	.030	.030
X	0.004/.008	.006	.004	.005	.005
Y	0.008/.018	.012	.013	.011	.011
E L/R min.	.040 min.	.114	.118	.113	.113
E F/R min.	.080 min.	.098	.085	.096	.073
F*	.315/.472	Refer to HP/M16 & HP/M16A (p7.6-7)			
SEALING RING OVERLAP CLRC	DESIGN				
	RING 1	.421	.421	.421	.421
	RING 2	.421	.421	.421	.421
	RING 3	.421	.421	.421	.421



* Notes

1. Clearances 'B', 'C' & 'D' to be confirmed after machining components to suit dimensions measured on Record Sheets HP/M6 and M6A (Section 7).

2. Clearance 'F' derived from measurements on Record Sheets HP/M16 and M16A (Section 7)

RECORD SHEET **HP27/019**

Page No. **6.28**

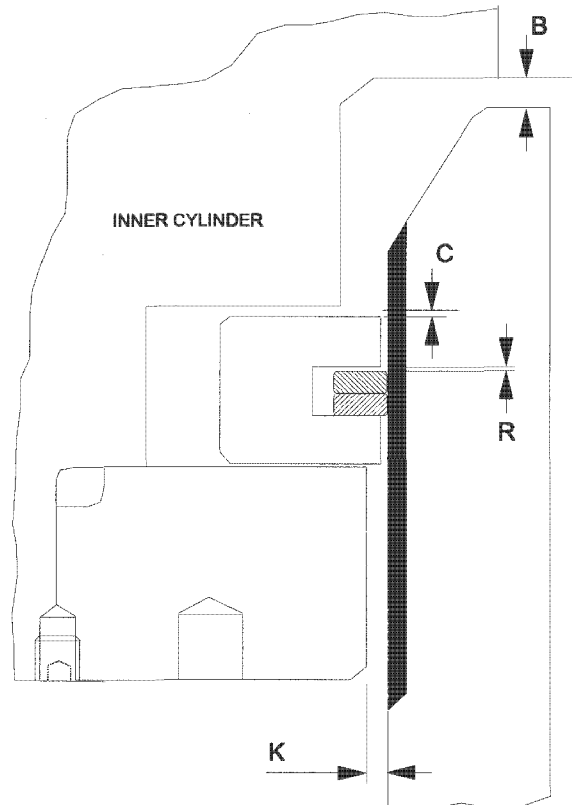
Title **HP HEATER CONNECTION ASSEMBLY**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **3/3/02** Checked **BI** Check List No. **1175**

Taken by **B Grierson** Date **16/3/03** Supervisor **BG** Date **16/3/03** Approved Date

REF DRAWING :- **R202/A1/5380 Rev A**



Readings in inches

	RADIAL		AXIAL		
	L	K	C	R	B
DESIGN	N/A	.040/.438	.016/.024	.016/.028	.217/.413
CARRIER L/R	---	.215 min	.020	.016	.315
CARRIER F/R	---	.224 min	.020	.016	.315

RING END CLRC	RING 1A	RING 1B	RING 2A	RING 2B
DES = .106/.118	Works assembled		N/A	N/A

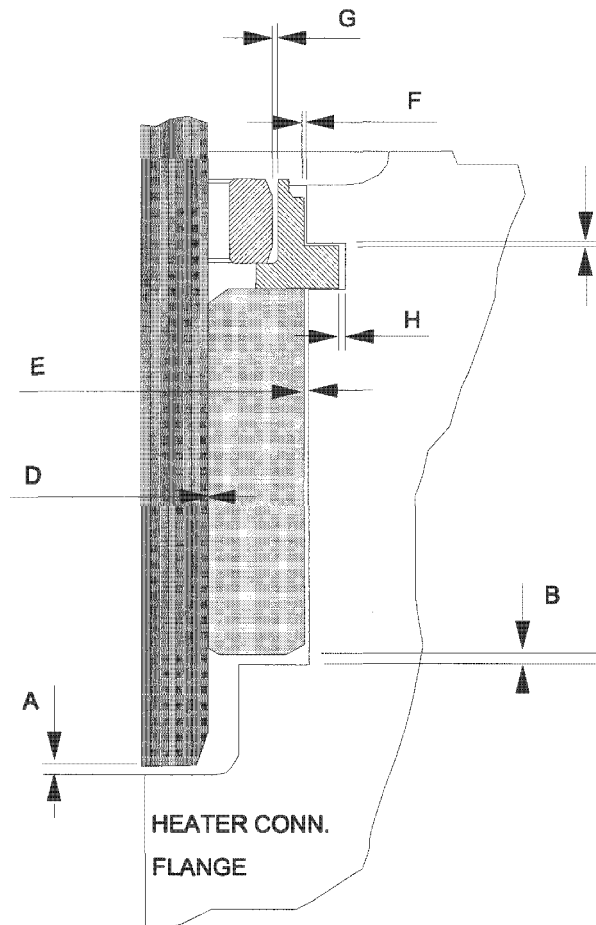
6 - HP REBUILD

IP7006934

Title **HP HEATER CONNECTION FLANGE CLEARANCES**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date	15/03/02	Checked	BI	Check List No.
Taken by	CFS	Date	18/3/03	Supervisor		Date
				Date	Approved	Date

REF DWG:- R202/AO/5396 REV C



Readings in inches

POSITION	A	B	C	D	E	F/G	H
DESIGN	.039/.079	.015/.025	.010/.015	-.001/-.003	.001/.003	.0004/.004	.008/.018
ACTUAL	.050	.020	.013	-.001/.002	.003	.004	.015

Final length of spool =

6 - HP REBUILD

IP7006935

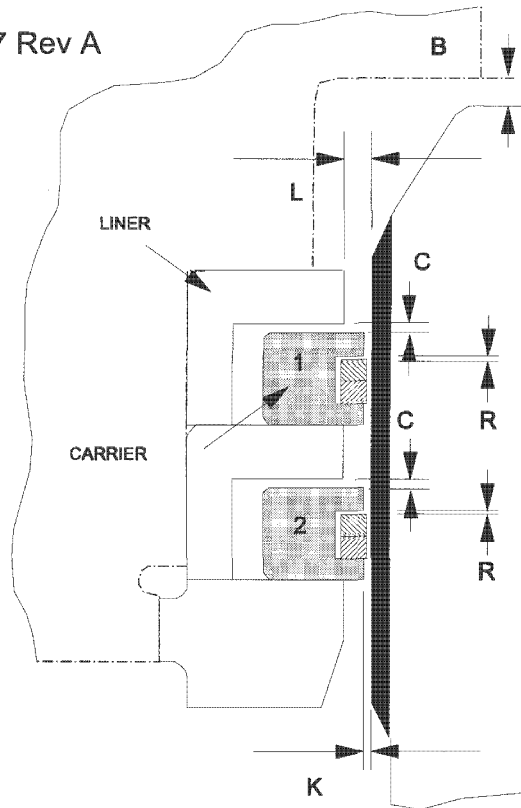
Title **HP LEAKOFF FOR IP ROTOR COOLING CONNECTION ASSEMBLY**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **3/3/02** Checked **BI** Check List No. **1175**

Taken by **BG** Date **16/3/03** Supervisor Date Approved Date

REF DRAWING :- R202/A0/5397 Rev A



Readings in inches

	RADIAL		AXIAL		
	L	K	C	R	B
DESIGN	.035/.279	0.020/.026	.024/.031	.017/.027	.472/.551
CARRIER 1	L/R .130 min F/R .278 min	NR	Works fitted components		.531
CARRIER 2	"	NR			

RING END CLRC	RING 1A	RING 1B	RING 2A	RING 2B
DES = 0.106/118	Works fitted components			

6 - HP REBUILD

IP7006936

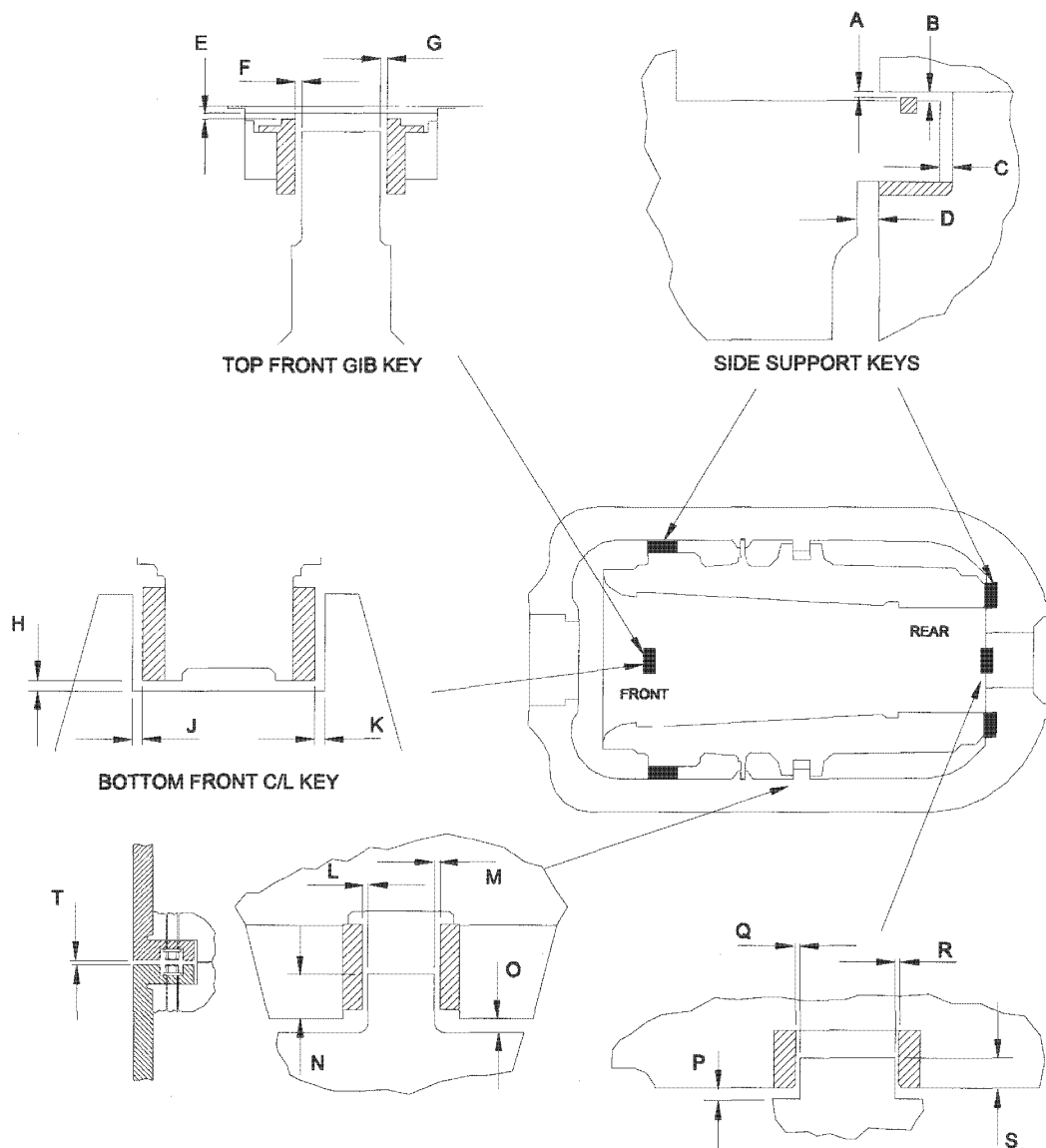
Title **HP INNER TO OUTER CYLINDER KEY CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **B** Check List No. **1175**

Taken by _____ Date _____ Supervisor _____ Date _____ Approved _____ Date _____

REF DWG:- R202/AO/5396 REV C



6 - HP REBUILD

IP7006937

Title

HP INNER TO OUTER CYLINDER KEY CLEARANCES

Contract

INTERMOUNTAIN

Unit No.

1

Serial No.

11246

Site Issue

A

Date

17/02/02

Checked

BI

Check List No.

1175

Taken by

Various

Date

March 03

Supervisor

MLS/BG

Date

Mar 03

Approved

Date

REF DWG:- R202/AO/5396 REV C

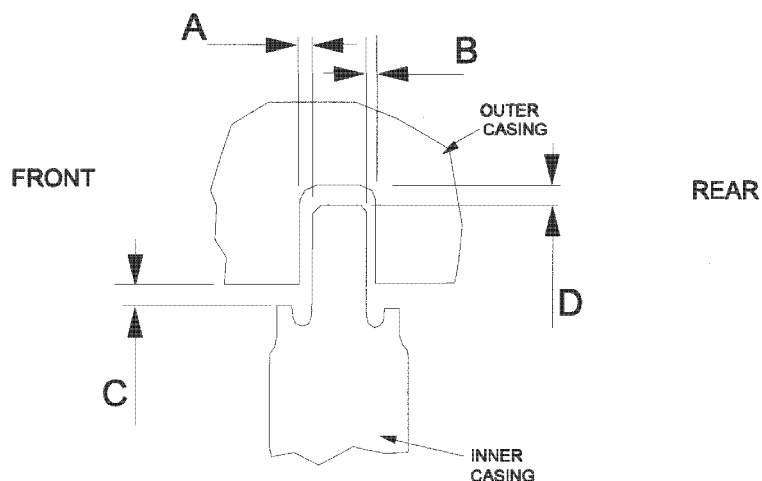
Readings in inches

SIDE SUPPORT KEYS								
	A		B		C		D	
	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
FRONT LHS KEY	.006/.008	.008	.031 MIN	.056	.250/.590	.424	.490/ 1.100	.810
FRONT RHS KEY		.008		.050		.480		.809
REAR LHS KEY	.006/.008	.008	.031 MIN	.042	.250/.590	.629	.490/ 1.100	.984
REAR RHS KEY		.006		.034		.552		1.009
FRONT TRANSVERSE LOCATING KEYS								
TOP KEY	E		F + G		BOTTOM KEY		H	J + K
DESIGN	.010/.030		.004/.006		DESIGN		.250/.400	.004/.006
ACTUAL	0.025		0.004		ACTUAL		375	004
AXIAL LOCATING KEYS								
	L + M		O		N		T (Design= .004/.027)	
	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL	POSITION	ACTUAL
LHS TOP	.004/.006	NR	.250/.420	NR	1.000 MIN	NR	LH Front	.024
RHS TOP		NR		NR		NR	LH Rear	.027
LHS BOT		.004		.804		2.5	RH Front	.030
RHS BOT		.004		.764		2.5	RH Rear	.020
REAR TRANSVERSE LOCATING KEYS								
	P		Q + R		S			
	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL		
TOP	0.250 MIN 0.400 MAX	NR	.004/.006	.006	1.000 MIN		1.5	
BOTTOM		NR		.004			1.5	

Title HP INNER TO OUTER CYLINDER BAFFLE ASSEMBLY CLEARANCES

Contract INTERMOUNTAIN Unit No. 1 Serial No. 11246
 Site Issue A Date 19/3/02 Checked BI Check List No. 1175
 Taken by B Grierson Date 18/3/03 Supervisor BG Date Approved Date

REF DWG :- R202(AO)5396 Sht 3 Rev C



INNER/OUTER CYLINDERS
IN FINAL AXIAL RELATIONSHIP

Readings in inches

POSITION	DESIGN	BOTTOM HALF BAFFLE		*TOP HALF BAFFLE	
		LHS	RHS	LHS	RHS
AXIAL - A	.039/.200	.125	.115	*	*
AXIAL - B	.039/.200	.128	.138	*	*
RADIAL - C	.160/.250	.129	.123	*	*
RADIAL - D	.200/.275	.213	.212	*	*

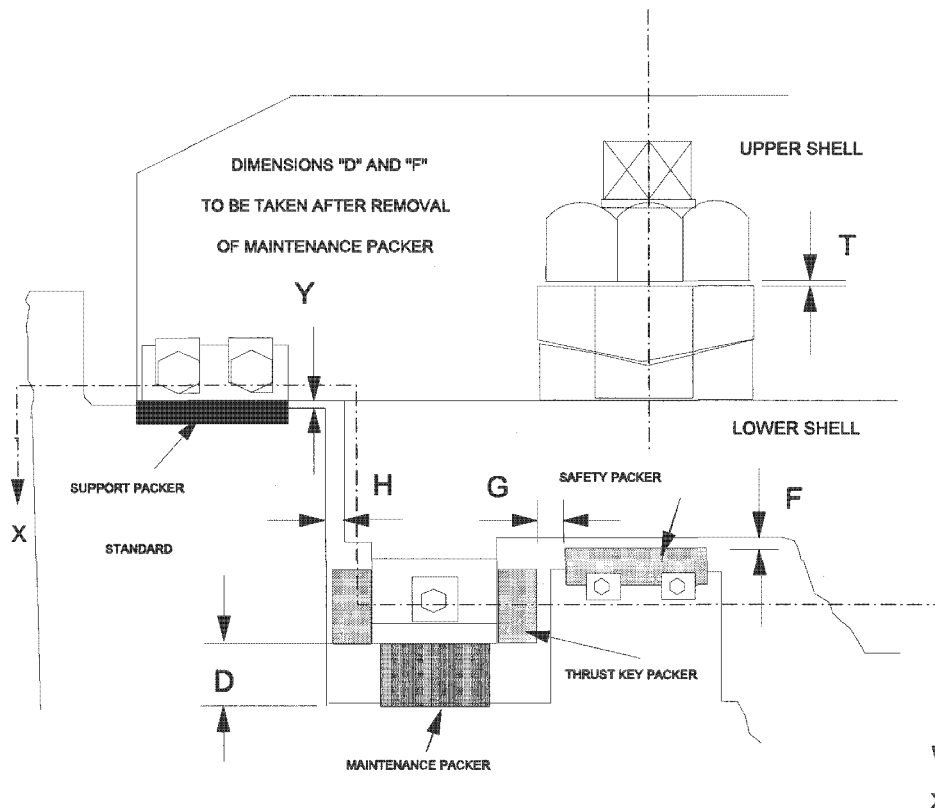
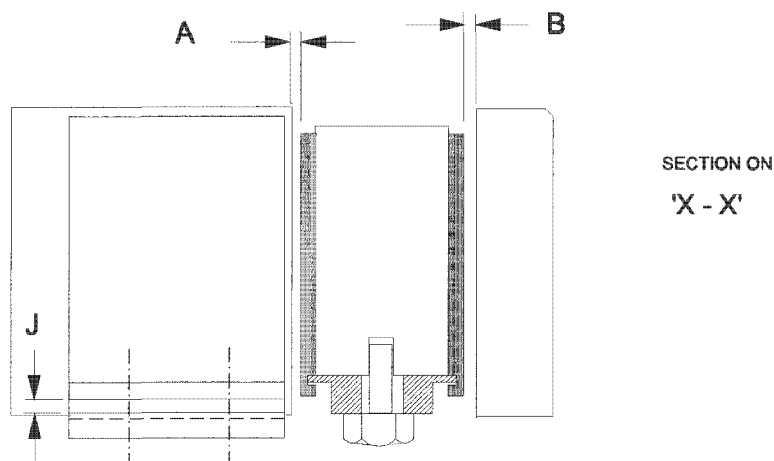
* No significant steps between top and bottom halves

Title **HP CYLINDER THRUST KEY & PAW GRIP CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by _____ Date _____ Supervisor _____ Date _____ Approved _____ Date _____



6 - HP REBUILD

Title **HP CYLINDER THRUST KEY & PAW GRIP CLEARANCES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by **W Falconer** Date **26/3/03** Supervisor Date Approved Date

Readings in inches

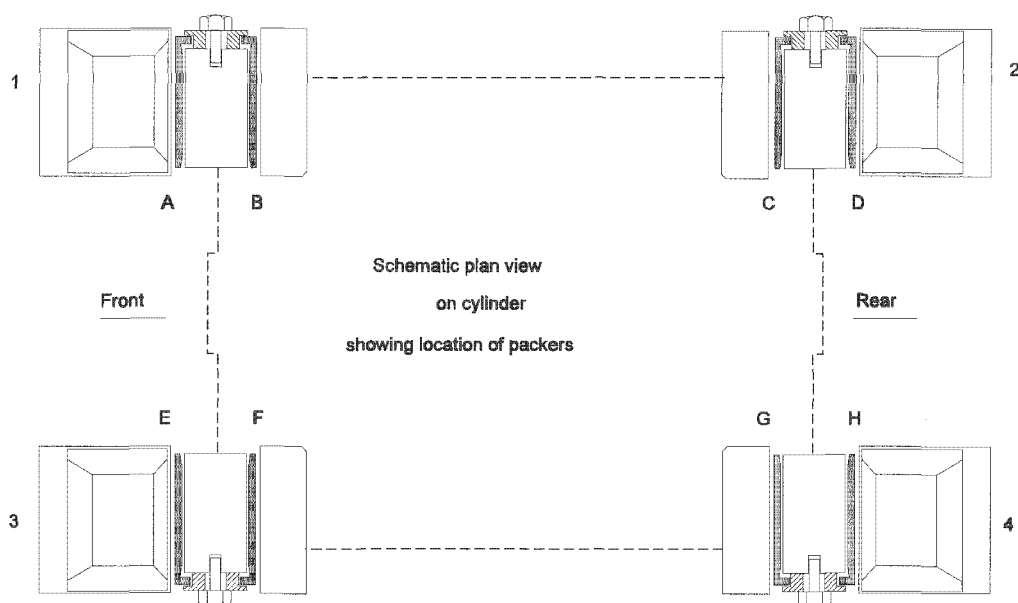
THRUST KEY PACKER CLEARANCE - "A+B" (TOTAL)			DESIGN =
CYLINDER LHS	LH FRONT KEY	LH REAR KEY	
	0.002	0.003	
CYLINDER RHS	RH FRONT KEY	RH REAR KEY	
	0.002	0.003	
TOP PALM TO STANDARD CLEARANCE 'J' =		SAFETY PACKER CLEARANCE	SAFETY PACKER TO LOWER PALM CLEARANCE 'F'
LH FRONT	NR	LH FRONT	0.063
LH REAR	NR	LH REAR	0.050
RH FRONT	NR	RH FRONT	0.062
RH REAR	NR	RH REAR	0.050
MAINTENANCE PACKER GAP - 'D'		PALM TO STANDARD GAP - 'Y'	
LH FRONT KEY	LH REAR KEY	LH FRONT KEY	LH REAR KEY
1.015	1.043	0.293	0.323
RH FRONT KEY	RH REAR KEY	RH FRONT KEY	RH REAR KEY
1.027	1.054	0.295	0.220
BOTTOM PALM TO STANDARD CLEARANCE - 'H'			
LH FRONT KEY	0.572	LH REAR KEY	0.478
RH FRONT KEY	0.590	RH REAR KEY	0.464
SAFETY PACKER TO THRUST KEY PACKER CLEARANCE - 'G'			
LH FRONT	0.352	LH REAR	0.070
RH FRONT	0.018	RH REAR	0.228
RETAINING BOLT CLEARANCE - 'T'			
LH FRONT		LH REAR	
RH FRONT		RH REAR	

Title **HP CYLINDER THRUST KEY & SUPPORT PACKER THICKNESSES**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **B** Check List No. **1175**

Taken by _____ Date _____ Supervisor _____ Date _____ Approved _____ Date _____

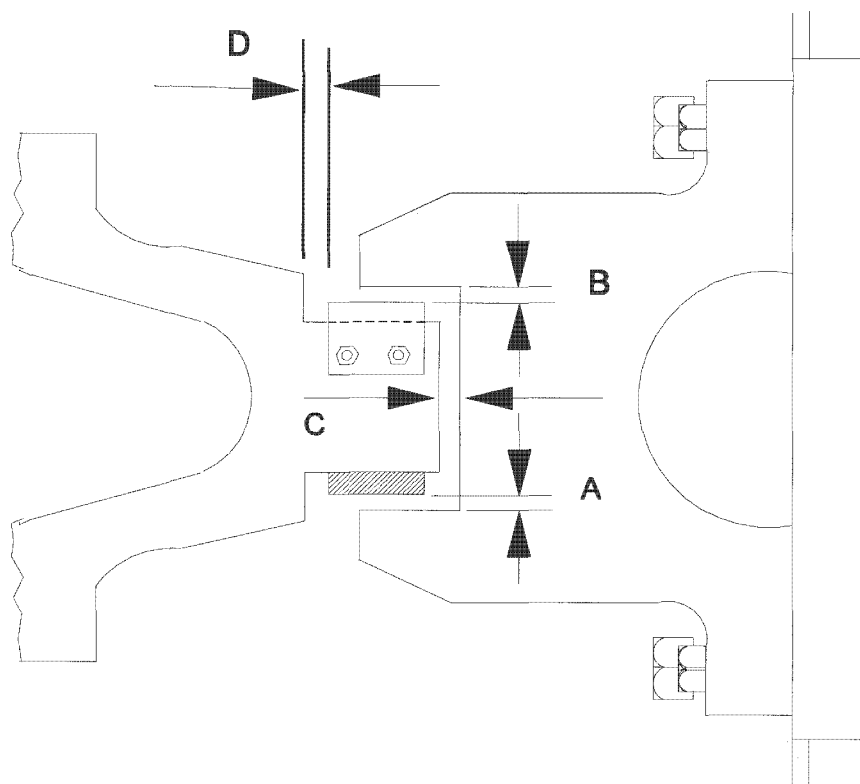


Readings in inches

THRUST KEY PACKER THICKNESSES	A	B	C	D
	As stripdown	As stripdown	1.100	0.642
	E	F	G	H
	As stripdown	As stripdown	1.131	0.632
CYLINDER PAW KEY WIDTH	LH FRONT	As stripdown	LH REAR	As stripdown
	RH FRONT	As stripdown	RH REAR	As stripdown
PEDESTAL KEYWAY WIDTH	LH FRONT	As stripdown	LH REAR	As stripdown
	RH FRONT	As stripdown	RH REAR	As stripdown
SUPPORT PACKER THICKNESS	LH FRONT	LH REAR	RH FRONT	RH REAR
	1.044	1.072	1.042	1.076
TEMPORARY SUPPORT PACKER THICKNESS	LH FRONT	As stripdown	LH REAR	As stripdown
	RH FRONT	As stripdown	RH REAR	As stripdown

Title **HP CYLINDER TO PEDESTAL CENTRE LINE KEY CLEARANCES**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI	Check List No.
Taken by	Date	Supervisor	Date	Approved	Date	



PLAN VIEW ON TYPICAL KEY ASSEMBLY

Readings in inches

CYLINDER POSITION	KEY POSITION	(A + B)		C		D	
		DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
FRONT	TOP						
	BOTTOM						
REAR	TOP						
	BOTTOM						

6 - HP REBUILD

IP7006943

Title HP CYLINDER COMPONENT BOLTS - TORQUE SETTINGS

Contract INTERMOUNTAIN Unit No. 1 Serial No. 11246

Site Issue A Date 17/02/02 Checked BI Check List No. 1175

Taken by Date Supervisor Date Approved Date

Drawing Ref. R212/A0/3856 Rev A, R265/A0/9371 Rev A, R265/A0/9372 - 9378 Rev B

LOCATION	ITEM NO.	QTY.	SIZE	DESIGN		ACTUAL
				Ft.Lb.	Nm	
HP INLET GLAND	3	4	2¼"-8UN -2A	3584	4859	
"	4	6	2"-8UN -2A	2580	3499	
"	5	6	1¼"-8UN -2A	608	824	
"	9	2	1"-8UN -2A	216	293	
STAGE 1 DIAPHRAGM	12	2	5/8"-11UN -2A	51	70	
STAGE 2 DIAPHRAGM	12	2	13/8"-8UN -2A	583	791	
"	13	2	1"-8UN -2A	216	293	
STAGE 3 DIAPHRAGM	12	2	13/8"-8un -2A	583	791	
"	13	2	1"-8UN -2A	216	293	
STAGE 4 DIAPHRAGM	12	2	13/8"-8UN -2A	313	424	
"	13	2	1" 8UN -2A	216	293	
STAGE 5 DIAPHRAGM	12	2	13/8"-8UN -2A	313	424	
"	13	2	1" 8UN -2A	216	293	
STAGE 6 DIAPHRAGM	12	2	13/8"-8UN -2A	313	424	
"	13	2	1" 8UN -2A	216	293	
STAGE 7 DIAPHRAGM	12	2	13/8"-8UN -2A	313	424	
"	13	2	1" 8UN -2A	216	293	
STAGE 7 DIAPHRAGM	12	2	13/8"-8UN -2A	313	424	
"	13	2	1" 8UN -2A	216	293	

Title **CONTROLLED TIGHTENING OF HP INNER CYLINDER BOLTS**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken W Gasser Date 21/3/03 Supervisor M Storey Date 21/3/03 Approved Date

JOINT BEING TIGHTENED : **HP INNER CYLINDER HALF JOINT**

DRAWING REFERENCE : **R200/A3/10344**

METHOD OF TIGHTENING : **HEATING**

REAR (GENERATOR END)

Readings in inches

LHS FLANGE JOINT

RHS FLANGE JOINT

BOLT No.	MEASUREMENT		EXTENSION		BOLT No.	MEASUREMENT		EXTENSION	
	BEFORE	AFTER	ACTUAL	DESIGN		BEFORE	AFTER	ACTUAL	DESIGN
11	.714	.739	0.025	.025/.031	12	.727	.752	0.025	.025/.031
23	.536	.580	0.044	.037/.045	24	.528	.573	0.045	.037/.045
7	.547	.592	0.045	.037/.045	8	.571	.612	0.041	.037/.045
19	.541	.583	0.042	.037/.045	20	.541	.579	0.038	.037/.045
3	.533	.571	0.038	.037/.045	4	.549	.588	0.039	.037/.045
15	.538	.579	0.041	.037/.045	16	.530	.571	0.041	.037/.045
1	.718	.749	0.031	.025/.031	2	.718	.749	0.031	.025/.031
17	.545	.578	0.033	.029/.035	18	.547	.578	0.031	.028/.035
5	.548	.580	0.032	.029/.035	6	.548	.578	0.030	.028/.035
21	.547	.576	0.029	.029/.035	22	.523	.556	0.033	.028/.035
27	.428	.459	0.031	.025/.031	28	.422	.453	0.031	.025/.031
9	.429	.461	0.032	.025/.031	10	.415	.446	0.031	.025/.031
25	.430	.460	0.030	.025/.031	26	.428	.453	0.025	.025/.031
13	.431	.458	0.027	.025/.031	14	.429	.460	0.031	.025/.031

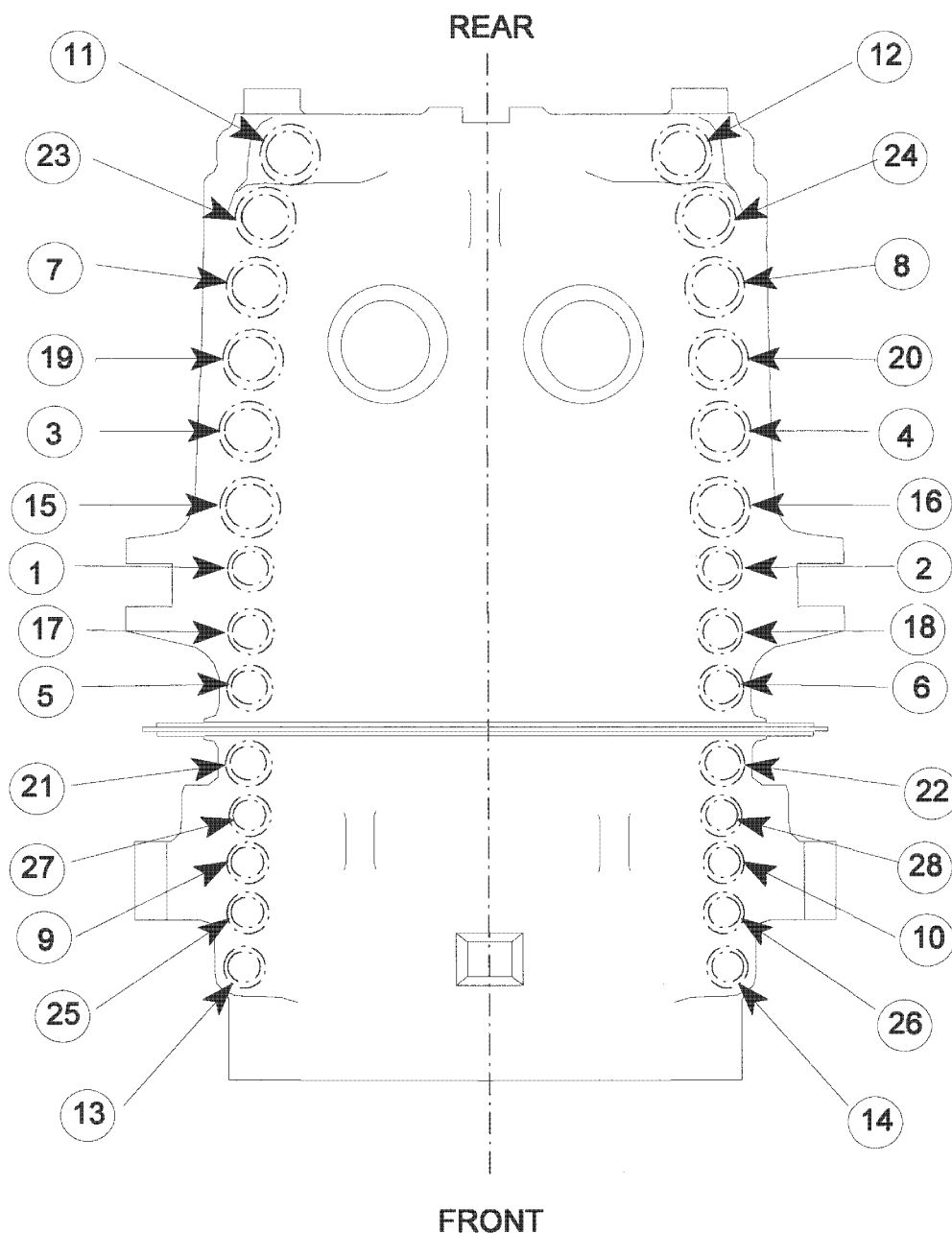
FRONT (TURBINE) END

THE IDENTIFICATION NUMBERS ARE MARKED ON THE STUDS AND NUTS

IT IS ESSENTIAL THAT THE STUDS ARE CHECKED AND RE-TIGHTENED PROGRESSIVELY.

Title **TIGHTENING SEQUENCE FOR HP INNER CYLINDER BOLTS**

Contract	INTERMOUNTAIN		Unit No.	1	Serial No.	11246
Site Issue	A	Date	17/02/02	Checked	BI	Check List No. 1175
Taken by	Date	Supervisor	Date	Approved	Date	



6 - HP REBUILD

Title **HP OUTER SHELL DISTORTION MEASUREMENTS - LASER**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**
 Site Issue **A** Date **5/3/03** Checked **WHF** Check List No. **1175**
 Taken by M Morris LMS Date 12/3/03 Supervisor Date Approved Date

Readings referenced to outer cylinder (gland locations A2 and E2)

Note: For horizontal positive no. = Right

For vertical positive no. = Up

Readings in inches

POSITION OF GLAND	HORIZONTAL TOPS OFF	HORIZONTAL TOPS ON	HORIZONTAL SHIFT	VERTICAL TOPS OFF	VERTICAL TOPS ON	VERTICAL SHIFT
T1 bore	0.023	0.024	0.002	0.012	0.009	-0.004
A1	0.003	0.004	0.001	0.006	0.004	-0.003
A2	0	0	0	0	0	0
B1	0.002	0.004	0.002	0.012	0.004	-0.008
B2/3	0.002	0	-0.002	0.018	0.004	-0.014
B5	0.002	-0.001	-0.003	0.026	0.008	-0.018
St 8	-0.006	-0.002	0.005	-0.004	-0.020	-0.016
St 2	-0.004	-0.003	0.001	-0.003	-0.016	-0.013
C1	0.002	0.002	0.001	-0.005	-0.017	-0.012
C7	0.002	0.001	-0.001	-0.006	-0.016	-0.010
D1	0	0	0	0.001	0	-0.001
D2/D3	-0.002	0.002	0	0.006	0.005	-0.001
D4	-0.002	-0.002	0	0.011	0.008	-0.003
E2	0	0	0	0	0	0
T2 bore	0.005	0.004	0	-0.016	-0.034	-0.018

Title HP OUTER SHELL DISTORTION MEASUREMENTS - LASER

Contract INTERMOUNTAIN Unit No. 1 Serial No. 11246
 Site Issue A Date 5/3/03 Checked WHF Check List No. 1175
 Taken by M Morris LMS Date 12/3/03 Supervisor Date Approved Date

Readings referenced to the T1 -T2 rotor bearings boreline

horizontal positive no. = Right For vertical positive no. = Up

Readings in inches

POSITION OF GLAND	HORIZONTAL TOPS OFF	HORIZONTAL TOPS ON	HORIZONTAL SHIFT	VERTICAL TOPS OFF	VERTICAL TOPS ON	VERTICAL SHIFT
T1 bore	0	0	0	0	0	0
A1	-0.020	-0.020	-0.001	-0.005	-0.004	0.002
A2	-0.022	-0.023	-0.002	-0.011	-0.006	0.005
B1	-0.020	-0.019	0	0.002	-0.002	-0.003
B2/3	-0.018	-0.022	-0.004	0.009	0.001	-0.008
B5	-0.018	-0.022	-0.004	0.020	0.008	-0.012
St 8	-0.024	-0.021	0.003	-0.009	-0.017	-0.008
St 2	-0.016	-0.016	0.001	0.001	0	-0.001
C1	-0.009	-0.009	0	0.002	0.003	0.001
C7	-0.007	-0.008	-0.001	0.005	0.010	0.005
D1	-0.008	-0.009	0	0.012	0.026	0.014
D2/D3	-0.010	-0.010	0	0.018	0.033	0.015
D4	-0.009	-0.009	0	0.024	0.037	0.013
E2	-0.006	-0.006	0	0.015	0.032	0.017
T2 bore	0	0	0	0	0	0

Title HP OUTER SHELL DISTORTION MEASUREMENTS - LASER

Contract INTERMOUNTAIN Unit No. ☐ Serial No. 11246
 Site Issue A Date 26/03/02 Checked BI Check List No. 1175
 Taken by M Morris LMS Date 12/3/03 Supervisor Date Approved Date

HP final alignment corrections for tops on condition

Note: For horizontal positive no. = Right For vertical positive no. = Up

Readings in inches

GLAND POSITION	IDEAL HORIZONTAL	IDEAL VERTICAL (excl'd'g ovality)	CORRECTED HORIZONTAL	CORRECTED VERTICAL	HORIZONTAL CORRECTION	ELEVATION CORRECTION
A2	0	0	0	0	0	0
B1	0	-0.001	0.004	0.004	-0.004	-0.005
B2/3	0	-0.002	0	0.004	0	-0.006
B5	0	-0.003	-0.001	0.008	0.001	-0.011
St 8	0	-0.005	-0.002	-0.020	0.002	0.015
St 2	0	-0.006	-0.003	-0.016	0.003	0.010
C1	0	-0.005	0.002	-0.017	-0.002	0.012
C7	0	-0.003	0.001	-0.016	-0.001	0.013
D1	0	-0.002	0	0	0	-0.002
D2/D3	0	-0.001	-0.002	0.005	0.002	-0.006
D4	0	0	-0.002	0.008	0.002	-0.008
E2	0	0	0	0	0	0

abcd

RECORD SHEET **HP18/001**Page No. **6.44**Title **HP CYLINDER FINAL BOX-UP CHECKS - INNER CYLINDER**Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by _____ Date _____ Supervisor _____ Date _____ Approved _____ Date _____

THE FOLLOWING CHECKS ARE TO BE COMPLETED PRIOR TO FITTING THE TOP HALF
INNER CYLINDER COVER

CHECK		INSPECTED BY (SIGNATURE)	
		ALSTOM	IPSC
1	ALL RELEVANT CHECKSHEETS COMPLETED AND APPROVED	W Falconer	
2	ROTOR UNBOXED BUMP CHECK COMPLETED	M.L. Storey	
3	ALL HORIZONTAL JOINTS CLEAN AND BURR FREE	B Grierson	
4	ALL GLAND ALIGNMENT KEYS AND DOWELS CORRECTLY FITTED	B Grierson	
5	ALL INTERNAL FITTINGS, PIPES, CLAMPS ETC FITTED	B Grierson	
6	ALL INSTRUMENTATION/CABLING FITTED WHERE APPLICABLE	N/A	
7	ALL FASTENERS LOCKED OFF TO THE REQUIRED STANDARD	B Grierson	
8	TV INSPECTION SATISFACTORILY COMPLETED	B Grierson	
9	ALL TEMPORARY ARRANGEMENTS USED TO PROTECT OPENINGS REMOVED	B Grierson	
10	WHERE CYLINDERS ARE TOP HALF SUPPORTED ENSURE THAT THE TEMPORARY SUPPORTS FOR THE BOTTOM HALF INNER CYLINDER ARE REMOVED	N/A	
11	ALL INTERNALS THOROUGHLY CLEAN	B Grierson	
12	CYLINDER BOXED-UP DATE	19 March '02	

6 - HP REBUILD

IP7006950

Title **HP CYLINDER FINAL BOX-UP CHECKS - OUTER CYLINDER**

Contract **INTERMOUNTAIN** Unit No. **1** Serial No. **11246**

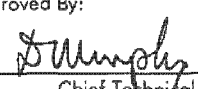
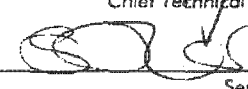
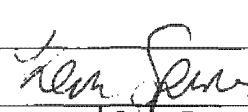
Site Issue **A** Date **17/02/02** Checked **BI** Check List No. **1175**

Taken by _____ Date _____ Supervisor _____ Date _____ Approved _____ Date _____

THE FOLLOWING CHECKS ARE TO BE COMPLETED PRIOR TO FITTING THE TOP HALF
OUTER CYLINDER COVER

CHECK		INSPECTED BY (SIGNATURE)	
		ALSTOM	IPSC
1	ALL RELEVANT CHECKSHEETS COMPLETED AND APPROVED	W Falconer	
2	ROTOR UNBOXED BUMP CHECK COMPLETED	B Grierson	
3	ALL HORIZONTAL JOINTS CLEAN AND BURR FREE	B Grierson	
4	ALL GLAND ALIGNMENT KEYS AND DOWELS CORRECTLY FITTED	B Grierson	
5	ALL INTERNAL FITTINGS, PIPES, CLAMPS ETC FITTED	B Grierson	
6	ALL INSTRUMENTATION/CABLING FITTED WHERE APPLICABLE	W Falconer	
7	ALL FASTENERS LOCKED OFF TO THE REQUIRED STANDARD	B Grierson	
8	TV INSPECTION SATISFACTORILY COMPLETED	B Grierson	
9	ALL TEMPORARY ARRANGEMENTS USED TO PROTECT OPENINGS REMOVED	B Grierson	
10	WHERE CYLINDERS ARE TOP HALF SUPPORTED ENSURE THAT THE TEMPORARY SUPPORTS FOR THE BOTTOM HALF INNER CYLINDER ARE REMOVED	B Grierson	
11	ALL INTERNALS THOROUGHLY CLEAN	B Grierson	
12	CYLINDER BOXED-UP DATE	22 March 2002	

UNAPPROVED

Name of Station INTERMOUNTAIN		Unit No: 1		S.T. No: T11246	
Title of Report HP TURBINE REPLANT			Report By W Falconer		
Summary					
<p>The unit was taken out of service on 1st March 2003 for a planned 28 day outage.</p> <p>Work included:-</p> <ul style="list-style-type: none"> • HP turbine rotor and inner shell (cylinder) replacement (upgrade) • IP turbine inspection • Steam admission valves inspection • Limited generator inspection and repair • Extensive boiler inspection and repair • Extensive boiler inspection and modification (upgrade) • Inspection and modification (upgrade) of various auxiliaries including boiler feed pump turbines and main CW cooling <p>This report describes the fitting of the new HP turbine rotor and inner shell.</p> <p>The turbine generator was resynchronised on 29th March 2003, and returned to commercial operation as scheduled.</p> <p>Formal performance tests were carried out during week commencing 7th April 2003. The results confirmed that the guaranteed efficiency had been exceeded.</p> <p>Stripdown and rebuild record sheets are contained in Checklist No. 1175</p>					
Internal Circulation			Report Approved By:		
<p>Mr S Dugdale, Chief Turbine Engineer, LTR</p> <p>Dr B W Roberts, Materials Unit</p> <p>Mr K Spires, Project Manager, TSR</p>			 Chief Technical Service Engineer		
			 Service Engineering		
			 Contract Engineer		
Output	875 MW	Inlet Press	2400 psig	Reheat Temp	1000°F
Speed	3600 rpm	Inlet Temp	1000°F	Back Press	
Commissioning Date	1986	Hours of Service of Machine		Hours since last Inspection	
Date of last Inspection	HP	IP1	IP2	GEN	
	LP1	LP2	LP3	LP4	
Number of Starts					
General Loading Particulars		Normally base load			

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1. INTRODUCTION

The Intermountain Generating Station in Utah, USA, is operated for IPA (Intermountain Power Agency) by IPSC (Intermountain Power Service Corporation). The station contains two large coal-fired units. Unit 1 is the second of two large turbine generator units, originally supplied by the General Electric Company, to be retrofitted with a new HP turbine rotor and inner shell (cylinder) designed and supplied by ALSTOM Power.

The equipment supplied was essentially a repeat of that supplied for Unit 2 but with the stage 1 diaphragm nozzle aerofoil angles modified to marginally close the exhaust ports and so reduce the steam swallowing capacity. The original GE arrangement consisted of two opposed first stage flows, followed by seven stages of impulse blading with traditionally riveted shrouds. The new rotor consists of 8 stages featuring advanced high efficiency integrally shrouded blades. The diaphragm blades are of the latest controlled flow type design. The fixed and rotating blades are protected against surface abrasion from steam-entrained solid particles by a plasma nitrided coating. The existing partial arc admission arrangement was converted to full arc admission, offering better efficiency during base load operation.

The work was planned and carried out by the power utility IPSC, and technical advice for the installation was provided by ALSTOM Power.

1.1 Outage organisation

The work was planned and conducted by IPSC using their own labour, supervision and tooling resources on a round the clock basis (nominally 12 hour shifts, seven days a week) for the duration of the outage. A number of contractors were employed to assist with the various elements of the operation.

ALSTOM Power Rugby, UK – HP turbine retrofit installation technical direction.

Edison ESI Westminster, California – Faro arm co-ordinate data for inner to outer shell interface matching (ALSTOM Power sub contract).

Laser Measurement Services Inc. (LMS) Playa del Ray, California - Laser alignment of rotor line for tops on/tops off distortion measurement (ALSTOM Power sub contract).

Continental Field Systems (CFS) Savannah, Georgia – general site machining operations including HP turbine interface features.

Mechanical Dynamics and Analysis Inc. (MD&A) Schenectady, New York – Technical direction for the IP turbine, boiler feed pump turbine and steam admission valves overhaul.

Mannings Dover, New Jersey – Bolting disassembly/assembly for the HP and IP turbine horizontal joint flanges.

Turbocare Chicopee, Massachusetts – supply and fitment of HP outer shell rotor glands.

Nova Tech Inc. Fort Collins, Colorado – Supply and installation of new PCB's to suit the modified governor valve characteristic required for conversion from partial arc to full nozzle arc control (ALSTOM Power sub contract).

IPSC personnel carried out instrumentation removal, calibration, and replacement.

1.2 Schedule outline

The machine was shut down early on 1st March 2003 for a planned outage of 28 days duration. Insulation blankets were removed from the top half shell barrel and the horizontal joint flange. Forced air cooling was applied to the HP and IP turbine horizontal joint bolts to promote cooling and so accelerate bolt removal.

The outage planning arrangements allowed for one test fitting of the new inner shell and rotor for acquiring setting data, following removal of the existing rotor and inner shell components. On completion of this initial measurement exercise the new rotor was removed and followed by a 'tops on/tops off' laser alignment procedure was carried out.

The new inner shell was then removed to permit various machining and fitting operations. These included steam inlet and steam extraction location bores and components, various key and support packers, and the exhaust end packing head (glandbox) which was sent to an off site machining facility.

The replacement inner shell bottom half was finally fitted followed by the rotor, top half diaphragms, inlet and exhaust gland packing heads, and top half inner and outer shells. Activities occurred generally in line with the station programme and the machine was restarted on Saturday 31st March as planned.

2. HP TURBINE STRIPDOWN

2.1 As found inspection

Because the rotor and complete inner shell were being retrofitted, inspection was limited to that necessary to gain a knowledge of previous running conditions, and for historical analysis. Observations can be described as being generally similar to those for the Unit 2 examination in 2002. Refer to report TS 2236.

The rotor was found to be in essentially undamaged condition with abrasion and multiple impact markings present to varying degrees on all blade aerofoils as a result of SPE (solid particle erosion). The journal surfaces had suffered only very light scoring due to foreign material in the lube oil supply.

Both left hand and right hand flows of inlet nozzles were in poor condition having suffered what is assumed to be the effects of SPE. This had resulted in significant loss of blade material at the trailing edges due to wear and fracture. In the main damage was located adjacent to the horizontal joint positions in both top and bottom halves. Photographs 1 and 2

The inlet gland had suffered heavy rubbing in the bottom centre position. Photograph 3. There was little sign of rotor contact in the top. The diaphragm rotor gland seals had also been rubbed in the bottom being worst at stages 2 to 4 i.e. the mid span position of the rotor. As these packing rings are all of the retractable type it must be assumed that the rubbing took place at high loads. There was no sign of the rings being stuck in the running position, and there is no reason to suppose that they may have been temporarily lodged during a shutdown. The precise reasons for the rubbing remains speculative.

There were no deposits of note on either fixed or rotating blade surfaces.

The T1 and T2 bearings exhibited normal load markings and appeared visually in good condition. Photographs 4 & 5. Subsequent ultrasonic NDE confirmed satisfactory white metal adhesion

2.2 Stripdown measurements

Because of the need to disassemble the shell as rapidly as possible due to programme restraints, and because there were no essential radial or axial clearances required, measurement was limited to a number of datums. These included rotor radial datums at the T1 and T2 standard oil deflector positions, and at the outer shell bolt on gland packing cases (bolt on gland boxes) and shell end bores. The axial position of the control rotor with respect to the shaft driven oil pump in the front standard was also recorded, though with the machine still relatively hot this had limited value.

The vertical datums measured at the T1 and T2 standards were considered unsatisfactory due to access difficulties. To ensure valid readings were obtained the rotor height with respect to the standards was established by 'bridge gauge' using vee blocks set on the horizontal joint and a straight edge.

The outer shell height change between support on the running keys, and that on the build keys was recorded during the changeover. Also recorded were the relative heights of the four corners of the existing inner shell with respect to the outer shell to assist with trial fitting of the new inner shell. Horizontal joint step measurements were made at the N1 and N2 packing heads relative to the outer shell, though there was no intention to disturb the bottom halves.

3. TRIAL FIT OF THE NEW INNER CASING AND ROTOR

Once the old rotor and inner shell had been removed the inlet bores and HP bled steam connection bore were honed to clean the surfaces and to remove any ovality present. Various measurements were taken in the top and bottom half outer shell using a Faro arm.

3.1 HP inner casing

On completion of the Faro arm measurements the new bottom half inner shell was lowered into place on temporary support packers sized to give adequate clearance with the rotor, and aligned axially and transversely close to the expected final position. A spare packer had been supplied for the front bottom transverse location key which is inaccessible with the inner shell fitted, and this allowed an equal/equal initial sizing for the packers so that the bottom half shell could be approximately centralised. The bottom half exhaust gland packing head was also refitted.

The inner shell was checked for a 'soft foot' by carrying out a weighing exercise at the four palm positions. Adjustments were made as necessary by shimming at the palm supports to give equal loading. Additionally a precision level instrument (Cooke's level) was used to measure the inner shell inclination with respect to the outer shell.

3.2 HP rotor

With the inner shell in place the new rotor was installed, and the radial position established with respect to the front and thrust standards, and to the outer shell packing head bores. The rotor was positioned axially to best advantage to suit the new outer shell shaft glands.

Having established the rotor axial and transverse radial position within the outer shell, the inner shell was manoeuvred until the correct axial and transverse radial location relative to the rotor had been achieved by comparison with the works build figures. The axial position of the rotor with respect to the inner shell is easily maintained using the brass setting gauge supplied for this purpose, during positioning operations.

The vertical position of the bottom half inner shell relative to the outer shell was determined using bridge gauge measurements at a location each end of the inner shell. Gland to rotor side clearances were measured at a number of positions. An ERAG device (otherwise known as an electronic mouse) had been made available and this also was used to establish the radial position of the rotor at each end of the inner shell. The figures obtained from all of the above were compared to the works build figures. The outer shell/rotor end bore datums and packing case bores/rotor datums were taken, together with various inner to outer shell datums.

From all of the above information correction data was established.

At this stage the rotor was removed and placed in the lathe with the IP rotor for setting of the couplings (see section 5.10).

4. HP TOPS OFF/ TOPS ON DISTORTION – LASER MEASUREMENT

With the rotors removed a laser line was set spanning not only the HP but also the IP turbine centreline, as both shells were measured in parallel.

Datum measurements were initially recorded in the open (tops off) condition. For the HP these included reference points at the T1 and T2 bearing bores and the outer casing end bores. Readings were also recorded at a number of locations in both the inner and outer shells.

The inner casing top half was then fitted to place and the horizontal joint lightly bolted only, as being a new assembly there is no distortion present. The outer shell was fitted and a survey made of the unbolted horizontal joint gap. This indicated that the expected relatively moderate levels of distortion were present. The horizontal joint bolts were then fitted and fully tightened.

At this stage a second set of laser readings were taken at the identical locations as previously taken in the tops off condition. The algebraic differences in readings between the tops on and tops off condition could then be calculated to arrive at correction values for inclusion in the final inner shell support and location key packer sizes.

Finally the outer casing support was transferred from the build keys (lower half support) to the running keys (upper half support) to establish the effect on the vertical and horizontal position of the complete inner/outer shell assembly, as measured at the outer shell end bores, relative to the T1 and T2 bearing bores. The movements seen were much as expected and broadly similar to those seen for the Unit 2 HP replant in 2002.

Refer to Appendix 1 for spreadsheets recording the measured values and calculated movements.

5. INTERFACE LOCATIONS BETWEEN NEW AND EXISTING COMPONENTS, AND ASSOCIATED MACHINING ACTIVITIES

Details of changes associated with the interface features between the old and the new equipment are shown on Interface drawing R202/A0/5396. The HP module general arrangement R277/A0/1341 should also be referred to.

5.1 Inlet connections

Reference drawing R202/A0/5387

The bores in the outer shell were honed to clean up and to remove any ovality which might be present. The hole centres were measured with respect to an outer shell datum position in both axial and transverse planes. This was compared with similar measurements recorded during manufacture of the inner shell. Once the new inner shell position had been fixed in the outer shell it was found that radial clearances for all four inlets were within tolerance thus eliminating the need for eccentric machining of the liner and guide ring. Circumferential locating pegs and slots are required where eccentric machining is necessary so these also were not needed.

The new hard-faced bore liners, retaining rings and guide rings were machined to give the required fits with each other and with the outer shell bores. The retaining rings were finally segmented and the assemblies completed.

5.2 HP heater bled steam connection

Reference drawing R202/A1/5380

The pipe was cut close to the flange on the outside of the outer shell, and the flange removed for modification. This consisted of honing the bore and fitting a liner, segmental ring and retaining ring. A new spool piece with a stellited section at the upper end was machined to give a shrink fit with the liner, and to give acceptable end clearance when in situ.

Whilst the lower end is fixed, the upper end is arranged to locate with a free floating seal arrangement. Faro arm checks confirmed that the axial and radial clearance margins were more than adequate to meet drawing requirements in the assembled condition.

5.3 HP leak off steam to IP rotor cooling

Reference drawing R202/A0/5397

A new pipe insert with integral flange and stellited top end was supplied. This was machined to suit the existing flange arrangement on the outside of the outer shell. Faro arm measurements confirmed that the generous axial and radial clearances designed in by virtue of the floating seal arrangement were present. The length was adjusted to give the drawing end clearance with the inner shell. Once assembled to position the new pipe insert was welded to the existing pipe.

5.4 Inner shell supports

The original inner palm support packers were removed and used for jig drilling the new packers. The old packers were used for initial setting of the new inner shell. A number of the existing packer retaining screws were broken and required drilling out. The size of the holding down fasteners has, by design, been increased from original.

5.5 Inner to outer shell axial and transverse location keys

All axial and transverse location keys/keyways were modified to take adjustable packers which allow fine setting of the inner shell with respect to the outer shell. The packers are attached to the key, or keyway, on the inner shell to eliminate the need for modification to the outer shell.

The top front transverse location key is located in a circular insert fitted into the outer shell. A new insert was provided with adjustable packers which were later sized to suit the required inner shell position.

5.6 Inner to outer shell steam baffle

The inner to outer casing interspace baffle on this inner casing is an integral part of the inner casing. The axial and radial clearances between the baffle and the outer casing were all within design tolerances.

5.7 Inner shell holding down bolts

The bottom half inner shell is fitted with holding down bolts for securing to the outer shell. The rear bolts were located in the same position as the original, but those at the front required repositioning to suit the new casing. The centres for these bolts were marked out during the trial fit of the new shell, and drilled and tapped prior to the final build. The new upper half casing does not overlap the bolts so L-shaped blocks are fitted to the upper casing to prevent the bolts unscrewing in service.

5.8 N1 exhaust gland packing head

The exhaust gland packing head was fitted with a ring extension to increase its axial length. After welding of the now redundant lifting eyebolt holes, the steam swept outer surface profile was modified by machining to match the stage 8 blade passage exhaust floor. This work was carried out at an off site machining facility in Salt Lake City, and supervised by Continental Field Systems.

5.9 N1 packing case, and N2 packing case and packing bore

New gland rings were supplied by IPSC, which were of Turbocare, and Steam Specialities manufacture. Turbocare technicians final-machined the seal fin bores to achieve the new design radial clearances with the new rotor incorporating allowances for the existing T slot bores ovality as measured.

5.10 HP/IP rotor coupling

The HP and IP rotors were placed in a portable lathe supplied by Continental Field Services, set up on the turbine deck. Truth checks were conducted on the IP rotor after 5 hours of continuous rotation to eliminate any bow due to lying stationary, as the rotor was suspected of having a slight permanent bend. The runout at the worst position was 0.0045" TIR at midlength. Runouts of 0.003" TIR were recorded at front and rear coupling peripheries, both at similar circumferential locations, and at 180 degrees to the peak of the rotor centrespan runout. No significant face error was recorded at the IP rear coupling (<0.0005"). There is no record of the runout for the IP rotor front coupling face. It had been judged safer not to machine the IP coupling faces unless absolutely necessary as this could have a detrimental effect on the overall balance condition. The problem with balance was further complicated as this rotor was considered to be thermally unstable.

The new HP rotor was orientated circumferentially with the IP rotor so that the phase marker matched the exact same position as the original rotor.

Alignment of the two rotors was achieved, followed by setting of the coupling concentricity (journal/journal) using slave bolts. Once satisfactory concentricity had been attained the coupling holes were line bored and finish honed. The original bolts were reused and new bolt sleeves fitted, machined to suit the new hole sizes. Photograph 7.

The rear coupling on the new HP rotor does not have a spigot (rabbit) as with the old arrangement. This eliminates the need to jack the HP rotor and outer casing axially towards the front to part the coupling for alignment checks, or for removal/installation of either HP or IP rotors.

5.11 Control rotor

The existing control rotor was refitted after confirming that the spigot (rabbit) had the correct fit with the HP rotor. This was confirmed to be within the design tolerance of 0.0005" clearance to 0.0015" interference. No machining or corrective work was necessary.

5.12 1st stage pressure and temperature measurements

The original inner shell had three thermocouples located after stage 1 which, in conjunction with the pressure monitor, were used for stress controlled turbine run-up and loading. Experience shows that thermocouples are prone to failure when fitted in inner casings. New thermocouples were, therefore, fitted in the top right side inlet pipe which is integral with the outer shell. The response of the thermocouples at this location will be the same as if fitted at the stage 1 position.

On the original inner casing there was a tapping for measuring 1" stage pressure. This is not required with full arc admission and has been deleted on the new assembly, the hole having been blanked by IPSC at the outer shell external facing. The pressure sensing pipe is now connected, externally, to one of the steam inlet pipes, at a location after the control valves.

5.13 Balance plane access holes

The access hole plugs in the bolt-on gland boxes (packing casings) were removed on Unit 2 following the replant and the balance plane holes in the rotor found to be out of line with the access holes. This was checked on Unit 1 and the holes found to line up perfectly.

It was reported by station staff that trim balancing had not been carried out at any time since original commissioning on the HP turbines so this problem had not been identified with the original GE rotors in place. As the two new HP rotors are identical it is certain that the mismatch on Unit 2 is a result of a problem with the gland boxes, and not with the new rotors.

6. FINAL ASSEMBLY

The inlet liners, retaining rings and guide rings were fitted into the outer casing and guide ring retaining dowels peened to lock (staked).

The heater connection flange, complete with new interconnecting spool pipe, was fitted and bolted to the outer casing with a new gasket supplied by IPSC. This activity occurred after the bottom half inner shell was finally in place.

The inner casing support packers were sized taking into account the tops on/tops off correction factor so that the vertical clearances would meet the design criteria in the fully boxed condition i.e. as works build. They were secured to the ledges in the outer shell with the new larger screws supplied by ALSTOM Power.

The inner to outer casing transverse location, and axial location key packers, once machined to size, were bolted, doweled and locked according to drawing instructions.

A television inspection of the bottom half inlet pipes and cold reheat pipes was carried out by IPSC.

The inner casing lower half was fitted to place followed by the N1 exhaust gland packing head bottom half. Photograph 8. Half joint steps confirmed the correct relative positions of these components were as intended.

The rotor was fitted (photograph 9) and the vertical position relative to the bottom half inner casing confirmed by bridge datum and by ERAG measurement. With the rotor centralised in the bearings side radial clearances and axial clearances were confirmed to be satisfactory. An unboxed bump check verified the total axial float and touch points in the expanding and contracting directions was as expected. Spot checks were made to confirm the expanding (rotor long) and contracting (rotor short) clearances were to design requirements in both inner and outer shells, with the rotor in cold set position. A 'weight on' HP/IP rotor alignment check was carried out and T2 bearing adjustments made as necessary. The changes in rotor height were subsequently accounted for in the final running key adjustments.

The top half N1 exhaust gland packing head was fitted with a top lead in place to confirm that vertical clearances were acceptable – a height adjustment had been made earlier on the side support keys. Once this gland box had been finally fitted, the top half inner casing was fitted (photograph 10) and a further bump check made to confirm the expected axial clearances were still present. The shell half joint bolts were fitted and stretched using electric resistance pokers, and the bolt extensions subsequently checked to be within design tolerance. The inner shell holding down bolts were fitted together with the bolt retaining brackets. The anti rotation crushing pegs were fitted and clearances checked. The top half outer casing was lowered into place, and a further bump check made confirming expected axial clearances were present.

The transfer from build keys to running keys indicated an outer casing height change with respect to the rotor, as measured at the casing end bores, of down 0.005" at the front and down 0.010" at the rear. New running packers were machined and fitted, to recover this change.

Finally the complete HP rotor and outer shell assembly were moved towards the rear to meet the IP rotor, and the coupling bolted. Concentricity checks confirmed that the required values had been repeated from the earlier lathe build. The rotor train was set on the front thrust pads. The rear push/pull key packers were adjusted to

suit this new position for the outer shell (clearance set on the front packer of the rear push/pull key assembly). In this condition a rotor to main oil pump axial datum was recorded in the front standard (refer to the build checklist No. 1175).

Thermocouples were fitted by IPSC to the outer casing to measure top to bottom temperature differential. These were attached to the outer skin at approximately mid length, and at an angle of approximately 10° to the vertical plane to avoid steam leak off connections. Photographs 11 and 12

With the machine finally on turning gear and start-up preparations well advanced it was found that the instrument for the HP (and indeed IP) differential expansion had not been calibrated despite earlier prompting. It is understood that this was due to a reluctance to re-dowel the coil head assembly to the standard in the mistaken belief that there had been no change due to fitting of the new rotor. In practice, of course, there is a change possible as a) the rotor lengths could be marginally different old to new, and b) an optimum axial position for the new rotor was selected relative to the outer casing glands during assembly operations.

It was reported by the MD & A engineer that data retrieved from the logging system showed that, with the rotor stationary and located axially on the front (datum) pads (26 March 2003), the instrument was reading 0.624". The GE cold zero is 0.630" i.e. rotor short by 0.006" (ALSTOM equivalent -0.006" rotor contracted).

Data retrieved from the logging system indicated that, with the machine on turning gear just prior to lighting the boiler, the HP DE was indicating a value of 0.600" (bearing in mind that the rotor position within the thrust clearance of 0.017" is not known). The GE cold zero is 0.630" i.e. rotor long by 0.030" (ALSTOM equivalent +0.030" rotor expanded).

The above assessment provided some confidence that the DE instrument was providing sufficiently accurate information to support safe operation of the machine without the need for calibration.

7. RETURN TO SERVICE

Saturday 29th March 2003

20:50 hours. Turning on steam. Vacuum had been raised some hours previously and the HP turbine was therefore already pre-warmed prior to starting the run up procedure. The station normal cold start practice was observed during run up to synchronous speed which was achieved without incident, and the generator synchronised at 23:00 hours the same day.

23:00 hours. Vibration levels at 3600 rpm

Bearing	T1	1.8	Mils peak to peak (standard mounted shaft riders)
	T2	1.7	
	T3	5.0	
	T4	3.5	
	T5	1.3	

Sunday 30th March 2003

After synchronising, the load was held at around 45 MW for some 7 to 8 hours due to the HP rotor/standard differential expansion being in alarm – rotor expanding (rotor long). The maximum value reached was 0.230 mils (ALSTOM equivalent + 0.400" RE), which is the advise trip level. It was understood from IPSC operations personnel that this is not unusual for a cold start. Load was increased to 85 MW from this point and held for a further 2 hours before raising to high load at normal loading rates.

During this period of high HP rotor/standard differential expansion attempts were made to grease both the front and centre standard sliding supports. This proved ineffective on the front standard as the grease ways were blocked i.e. instead of grease appearing from the return line telltales at the front of the standard, it emerged instead from under the rear of the support packers close to the supply line inlet point at the rear of the standard. This suggested that the standard may be tilted and that free expansion of the standard was impeded by lack of lubrication.

The grease lines for the centre (thrust) standard were found to be incorrectly piped and again it was not possible to satisfactorily grease the support packers. Problems at this standard would not be associated with the HP differential expansion difficulties, and this information is reported for completeness.

The standard sliding support system had not been subject to any maintenance during this outage.

14:16 hours 650 MW

Bearing	T1	3.7	Mils peak to peak (standard mounted shaft riders)
	T2	0.5	(T2 suspect reading)
	T3	3.4	
	T4	3.0	
	T5	1.3	

15:34 Unit trip from 815 MW due to a boiler control system fault.

Adjustment made to balance weights by IPSC

Monday 31st March 2003

04:45 hours Resynchronised

500 MW (heatsoaked)

Bearing	T1	2.6	Mils peak to peak (standard mounted shaft riders)
	T2	1.8	(T2 reading now valid)
	T3	3.4	
	T4	1.3	
	T5	1.2	

HP Differential expansion 0.443" (ALSTOM equivalent +0.187")

IP Differential expansion 0.507"

HP outer shell midlength temperature – top 674 deg F

HP outer shell midlength temperature – bottom 780 deg F ΔT -106 °F

At this point the writer left site.

It is understood from site that further attempts at balance improvement have been made. The current information reported from site is:-

Thursday 8th May 2003

952 MW (heatsoaked)

Bearing	T1	1.3	Mils peak to peak (standard mounted shaft riders)
	T2	1.9	
	T3	3.0	
	T4	1.9	
	T5	1.4	

HP Differential expansion 0.451" (ALSTOM equivalent +0.179")

IP Differential expansion 0.488"

HP outer shell midlength temperature – top 685 deg F)

HP outer shell midlength temperature – bottom 736 deg F) ΔT -51 °F

The contractual performance test was carried out 16th & 17th April 2003 with a satisfactory result (0.45 % better than guarantee).

8. RECOMMENDATIONS

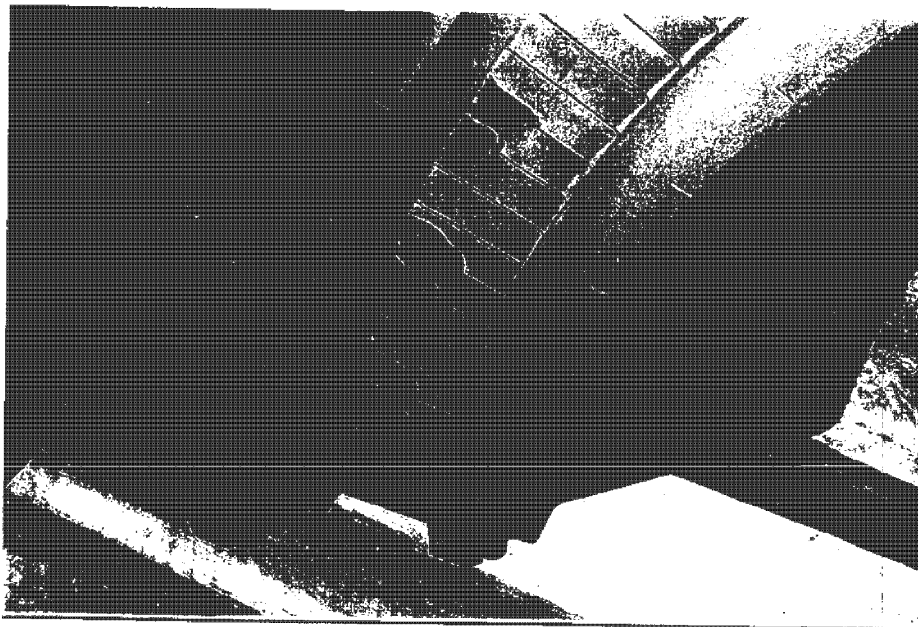
1. **Standard lubrication** – Difficulties with HP differential expansion (rotor long) during cold and warm start ups are not helped when the front bearing standard is unable to expand freely. At the first practical opportunity the standard supports should be removed for cleaning and examination. The grease lines should be cleared and charged with the recommended grade of grease. Greasing should be carried out at suitable intervals i.e. in line with the operating/maintenance manual.

Should standard expansion be considered a significant problem there are modifications which can be made to sliding surfaces. The current ALSTOM system uses DU material which has proved very successful.

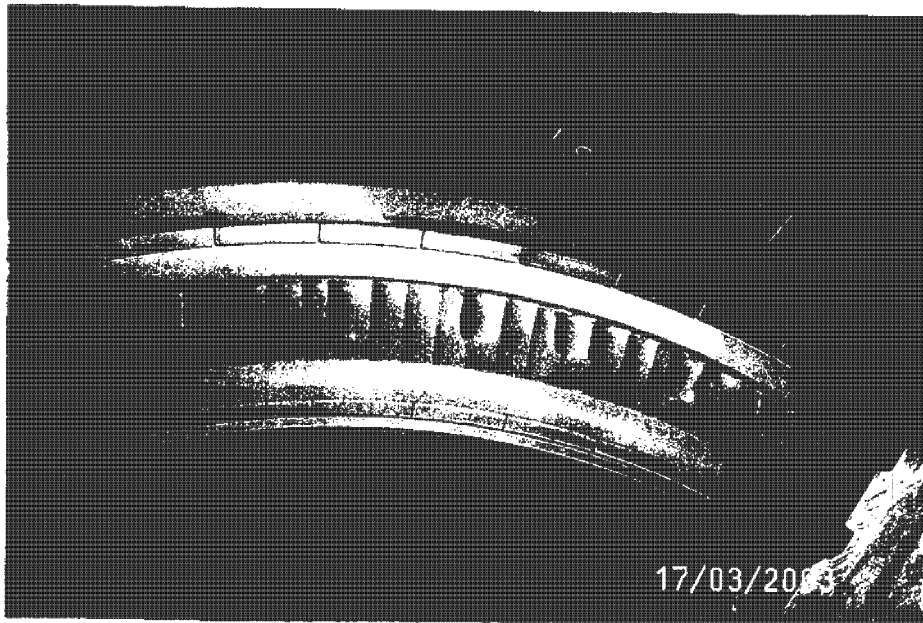
2. **TSE HP DE** – It is of some concern that there is some 0.1" difference in the HP rotor to standard differential expansion between units 1 and 2. The reason for this is not clear. To try and understand this better, and in view of the fact that the instrument on Unit 1 (and perhaps also Unit 2 ?) have not been calibrated, it is recommended that both instruments are calibrated at the first opportunity. Actual differential expansion can be verified whenever access can be gained to the front standard to measure the axial datum. This can then be compared to the cold datum. Refer to the rebuild checklist for each unit for datum location, and for the cold datum values. Measurements should be taken with the rotor pushed onto the thrust pads (rotor towards the front standard), and

push/pull key clearances accounted for (refer to OEM instructions). The instrument can then be adjusted to reflect the figures resulting from the mechanical measurements. With accurate data available further assessment can be made.

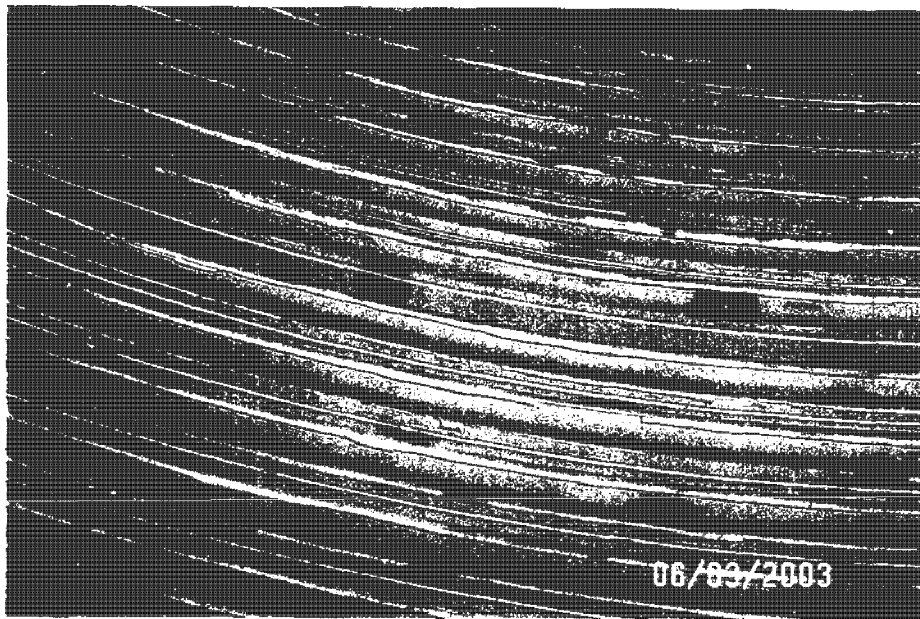
9. PHOTOGRAPHS



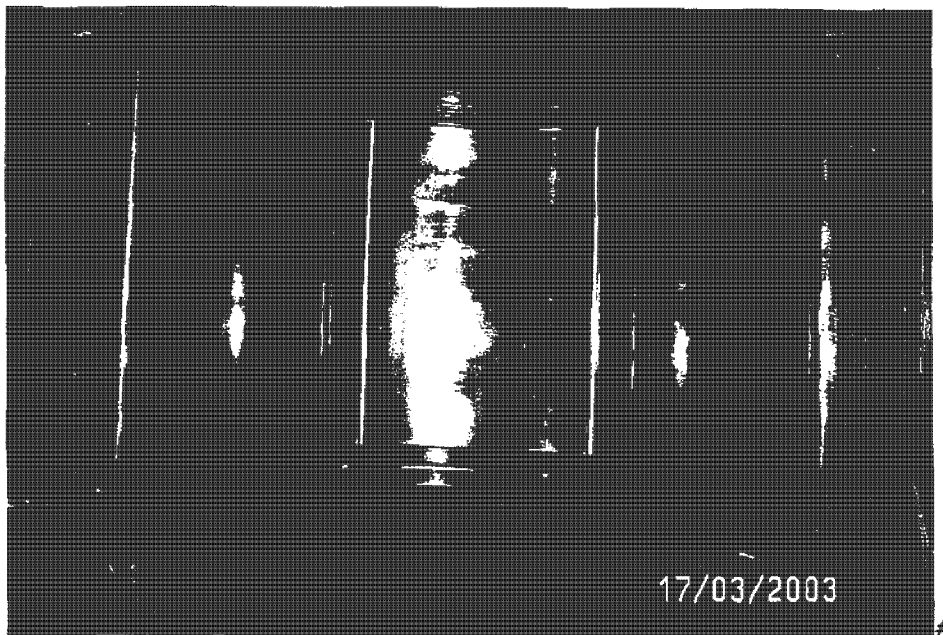
Photograph 1 - TYPICAL CONDITION OF OLD NOZZLE



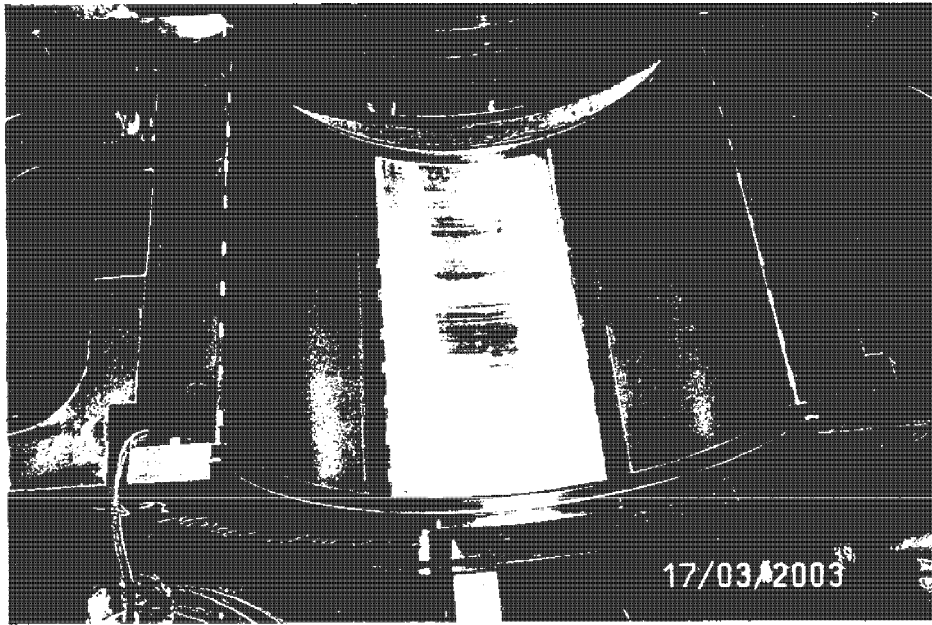
Photograph 2 - TYPICAL CONDITION OF OLD NOZZLE



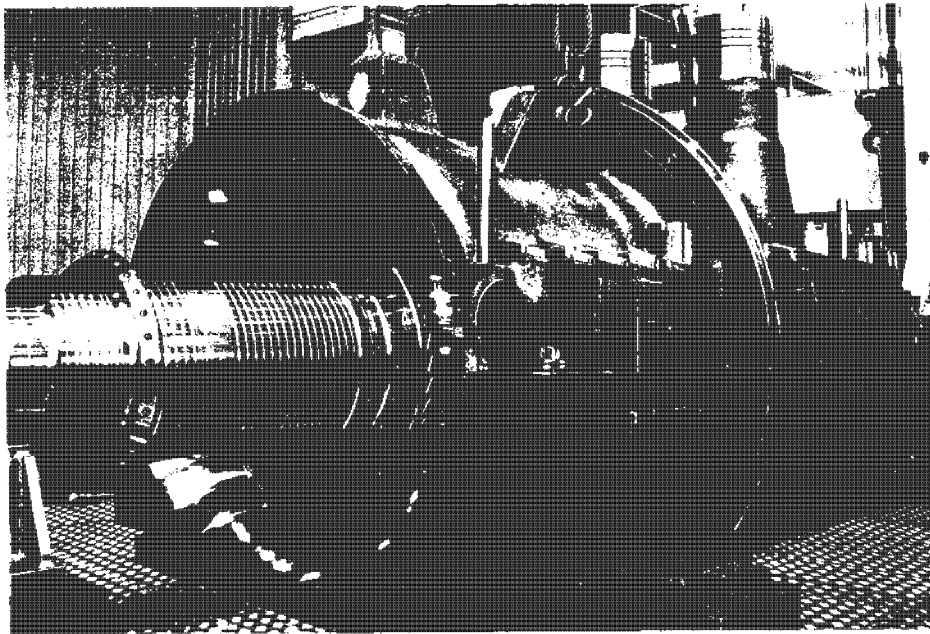
Photograph 3 - OLD INLET GLAND SHOWING HEAVY BOTTOM RUBS



Photograph 4 - HP FRONT BEARING T1 (RE-USED)



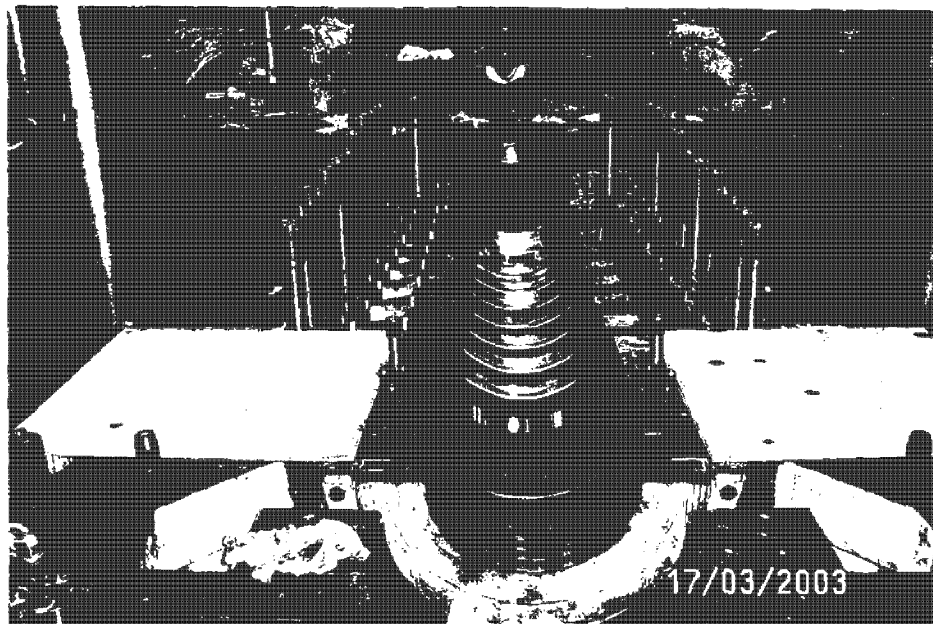
Photograph 5 – HP REAR BEARING T2 (RE-USED)



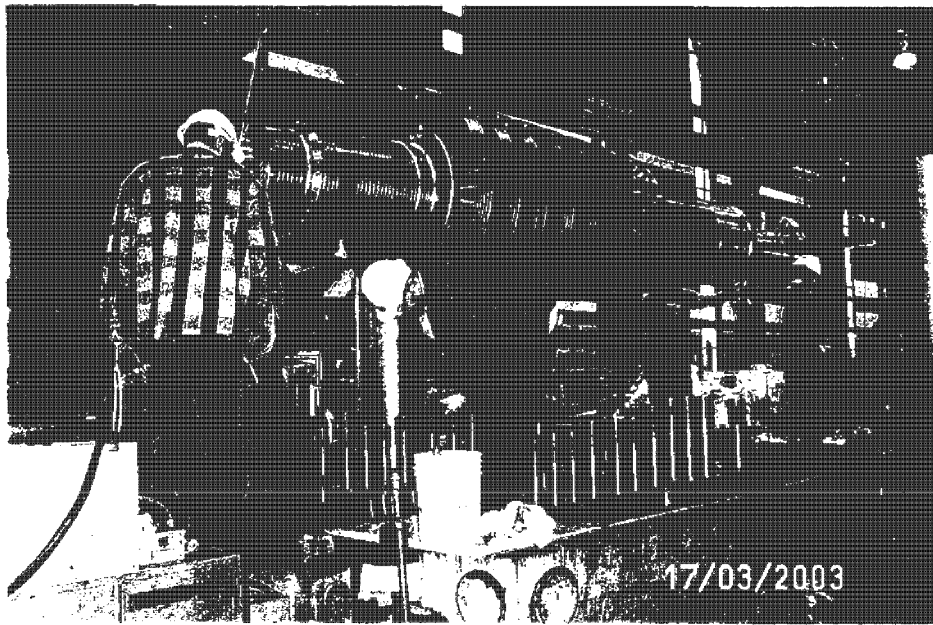
Photograph 6 – REPLANT MODULE AT RUGBY WORKS



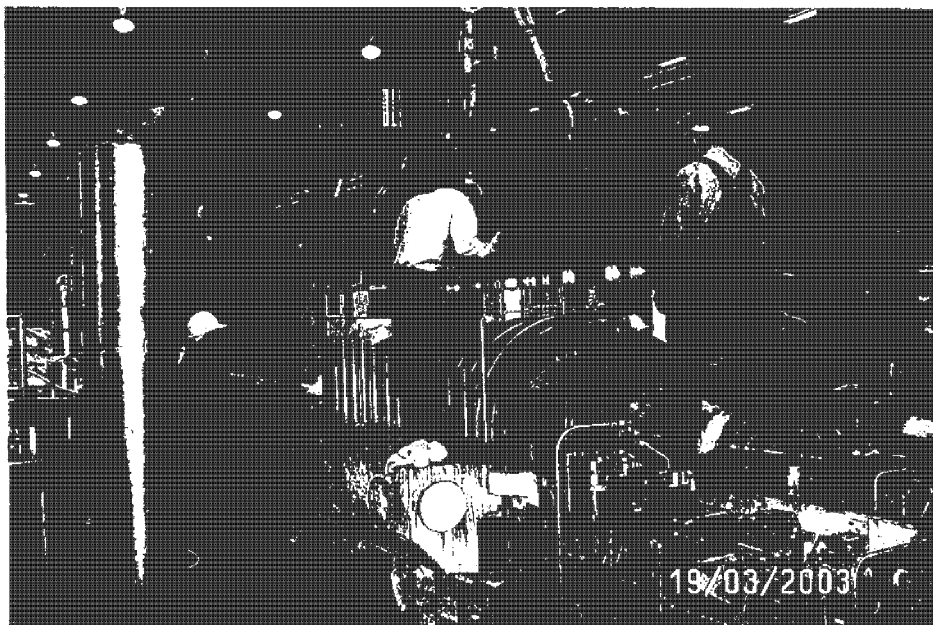
Photograph 7 – SETTING CONCENTRICITY, HP AND IP ROTORS IN LATHE



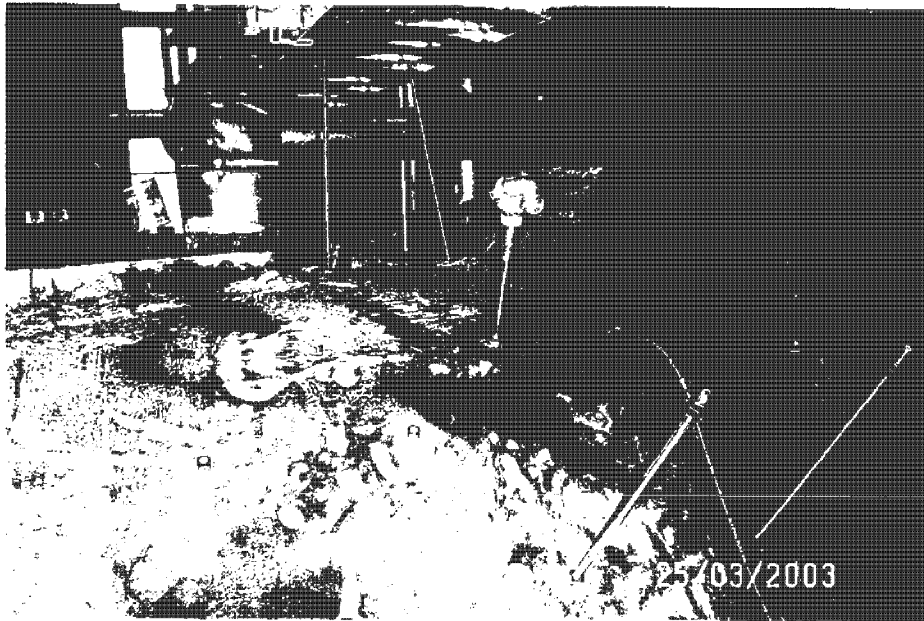
Photograph 8 – BOTTOM HALF INNER CYLINDER IN PLACE



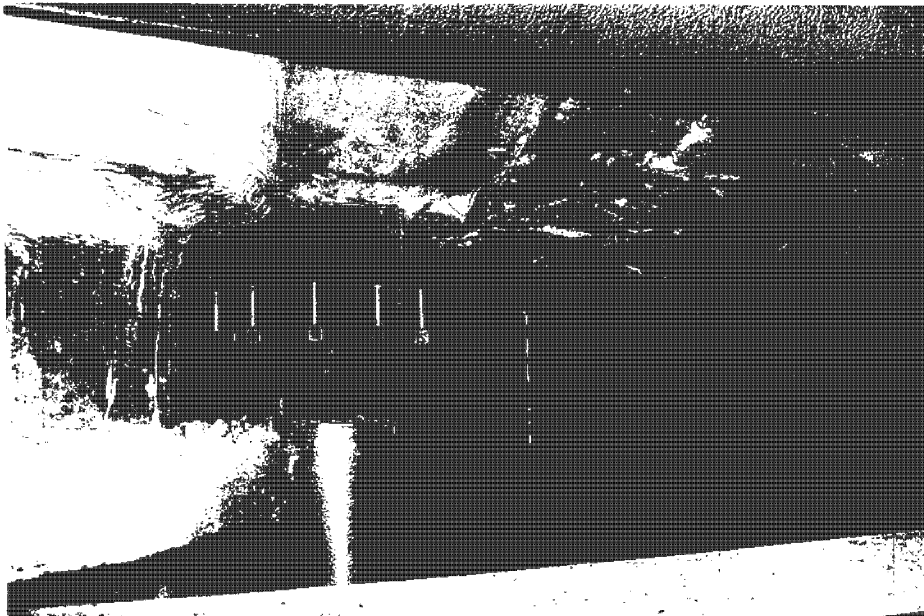
Photograph 9 - ROTOR FINAL ASSEMBLY



Photograph 10 - INNER CYLINDER TOP HALF FINAL FIT



Photograph 11 – OUTER CYLINDER TOP HALF MID LENGTH THERMOCOUPLE



Photograph 12 – OUTER CYLINDER BOTT HALF MID LENGTH THERMOCOUPLE

Appendix 1

BASED ON N1G2—N2G13 LINE

TOPS OFF --> TOPS ON SHIFTS								
INTERMOUNTAIN POWER - UNIT #1								
HP SECTION								
Note -- + # For Hor = Right					Note -- + # For Vert = Up			
LOCATION	DISTANCE	HOR OFF	HOR ON	HOR SHIFT	VERT OFF	VERT ON	VERT SHIFT	
T1 Bore	-11	23	24	2	12	9	-4	
N1 G1	-8	3	4	1	8	4	-3	
N1 G2	0	0	0	0	0	0	0	
N1 G3	4	2	4	2	12	4	-8	
N1 G4/5	16	2	0	-2	18	4	-14	
N1 G7	29	2	-1	-3	26	8	-18	
8	44	-8	-2	5	-4	-20	-16	
5	70	-4	0	4	-6	-21	-14	
2	105	-4	-3	1	-3	-16	-13	
Nozzle Bore	111	2	4	1	-7	-20	-13	
N2 G1	126	2	2	1	-5	-17	-12	
N2 G7	149	2	1	-1	-6	-16	-10	
N2 G8	153	0	0	0	1	0	-1	
N2 G9/10	160	-2	-2	0	6	5	-1	
N2 G11	168	-2	-2	0	11	8	-3	
N2 G13	179	0	0	0	0	0	0	
OD 2	183	4	1	-3	-16	-35	-19	
T2 Bore	192	5	4	0	-16	-34	-18	

BASED ON T1 BORE — T2 BORE LINE

TOPS OFF → TOPS ON SHIFTS								
INTERMOUNTAIN POWER - UNIT #1								
HP SECTION								
Note -- +# For Hor = Right					Note -- +# For Vert = Up			
LOCATION	DISTANCE	HOR OFF	HOR ON	HOR SHIFT	VERT OFF	VERT ON	VERT SHIFT	
T1 Bore	-11	0	0	0	0	0	0	0
N1 G1	-6	-20	-20	-1	-5	-4	2	
N1 G2	0	-22	-23	-2	-11	-6	5	
N1 G3	4	-20	-19	0	2	-2	-3	
N1 G4/5	16	-18	-22	-4	9	1	-8	
N1 G7	29	-18	-22	-4	20	8	-12	
8	44	-24	-21	3	-9	-17	-8	
5	70	-19	-17	3	-7	-12	-5	
2	105	-16	-16	1	1	0	-1	
Nozzle Bore	111	-10	-9	1	-2	-2	-1	
N2 G1	126	-9	-9	0	2	3	1	
N2 G7	149	-7	-8	-1	5	10	5	
N2 G8	153	-8	-9	0	12	26	14	
N2 G9/10	160	-10	-10	0	18	33	15	
N2 G11	168	-9	-9	0	24	37	13	
N2 G13	179	-6	-6	0	15	32	17	
OD 2	183	-1	-4	-3	-1	-3	-2	
T2 Bore	192	0	0	0	0	0	0	

INTERMOUNTAIN POWER - UNIT #1											
HP FINAL ALIGNMENTS - TOPS ON											
3/12/2003 1:00PM											
										Shim +	
Note: + is Rt & Up										Means Add	
LOCATION	DIST.	IDEAL		CORRECTED		SIDE	ELEV	SHIM			
		Hor	Vert	Hor	Vert	MOVE	MOVE	LEFT	RIGHT		
N1 G2	0	0	0	0	0	0	0	0	0		
N2 G13	179	0	0	0	0	0	0	0	0		
Status											
N1 G2	0	0	0	0	0	0	0	0	0		
N1 G3	4	0	-1	4	4	-4	-5	-8	-1		
N1 G4/5	16	0	-2	0	4	0	-6	-5	-8		
N1 G7	29	0	-3	-1	2	1	-11	-10	-12		
8	44	0	-5	-2	-20	2	15	17	13		
5	70	0	-6	0	-21	0	15	15	14		
2	105	0	-6	-3	-16	3	10	13	7		
Nozzle Bore	111	0	-6	4	-20	-4	14	10	17		
N2 G1	126	0	-5	2	-17	-2	12	10	14		
N2 G7	149	0	-3	1	-16	-1	13	12	13		
N2 G8	153	0	-2	0	0	0	-2	-2	-2		
N2 G8/10	160	0	-1	-2	5	2	-6	-4	-9		
N2 G11	168	0	0	-2	8	2	-8	-6	-10		
N2 G13	179	0	0	0	0	0	0	0	0		

		BUILDING KEYS --> RUNNING KEYS SHIFTS						
		INTERMOUNTAIN POWER - UNIT #1						
		HP SECTION						
		Note -- + # For Hor = Right			Note -- + # For Vert = Up			
LOCATION	DISTANCE	HOR BUILD	HOR RUN	HOR DIFF.	VERT BUILD	VERT RUN	VERT DIFF.	
T1 Bore	-11	0	0	0	0	0	0	0
N1 G2	0	-23	-23	0	-6	-12	-6	
N2 G13	179	-6	-7	-1	32	26	-6	
T2 Bore	192	0	0	0	0	0	0	0

From: <wally.falconer@power.alstom.com>
To: "Phong Do" <PHONG-D@ipsc.com>
Date: 4/9/03 2:07AM
Subject: Intermountain Unit 1 HP replant - checklist (1)

Hello Phong

As promised I am forwarding a copy of the checklist in unapproved form. The formal copy will arrive in due course. Because the file sizes are quite large I am sending it in two separate emails. (Sections 2,6,7,8 & index)

(See attached file: 6HP-RBUS.pdf)(See attached file: CL_INDEX.pdf)

Hope you are enjoying getting to know your family again ! I know I am.

Best regards, Wally

CONFIDENTIALITY:

This e-mail and any attachments are confidential and may be privileged. If you are not a named recipient, please notify the sender immediately and do not disclose the contents to another person, use it for any purpose, or store or copy the information in any medium.

IP7006979



INTERMOUNTAIN UNIT 1

Checklist number :
1175

Serial No. T11246

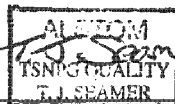
HP CYLINDER - WORKS BUILD

Compiled by on behalf
of ALSTOM Steam Turbines

D.W. Blower

Date:- *20/1/2003*

Approved and Issued by
Rugby Works Quality
Q.A. Manager



Date:- *23/01/2003*

IP7006980

ALSTOM

SCHEDULE OF ACTUAL EXTENT BUILD

CONTRACT:- INTERMOUNTAIN UNIT 1

ITEMS OF PLANT:- HP INNER CYLINDER

SERIAL No. T11246

MANUFACTURING UNIT RESPONSIBLE:- RUGBY

DATE: 20/01/2003

CIRCULATION:-

CONSTRUCTION SUPERINTENDENT	-	CSU (2 COPIES)
CONTRACTS ENGINEER	-	PMD (2 COPIES)
LEADER SUPPORT GROUP	-	TEG
MANAGER	-	SERVICE ENG.
QUALITY MANAGER	-	QUALITY DEPT.

The HP inner cylinder assembly was erected at Rugby on temporary supports blocks with the HP rotor supported in temporary bearings. The HP inner cylinder minus the inlet gland carrier was dispatched to site as a bolted assembly on its own shipping frame. The HP rotor was dispatched as a separate item.

The following items should be noted on assembly at site.

The HP inner cylinder will be dismantled at site to facilitate assembly into the existing HP outer cylinder. Consequently, the tightening and measuring of the horizontal joint studs has not been carried out at Rugby. This work on the HP inner cylinder is to be carried out at site. The inlet gland carrier when received at site will only require assembling to the inner cylinder as all associated work has been completed at Rugby.

All clearances recorded are minimum readings and were taken with the rotor set in its axial cold setting position. The rotor was also positioned radially, so that the datum position, which is on the rear end coupling, was on the top centre line.

All diaphragm and gland packing rings were wedged up in the direction of steam flow for all axial checks.

The radial clearances were established using the following method.

- The gland segment rings were supported with a plate spring inserted each side, between the back of every segment and the bore of the diaphragm and gland carriers.
- Soft wire was then placed across the centre of the bottom segments and also along the bottom of the rotor shrouding diameters.
- Prior to assembling the HP rotor, 0.015 " thick shim 4" wide was placed along the bottom of both bearings.
- The HP rotor was then assembled onto the shim.

IP7006981

- The top half diaphragms and glands were assembled, followed by the top half inner cylinder.
- Horizontal joint bolts tightened to close joint.
- The HP rotor was then carefully lifted hydraulically, just enough to enable the removal of the shim from the bottom of bearings.
- The rotor was then lowered into its bearings and was left long enough for soft wire impressions to take effect.
- The rotor was again lifted hydraulically, just enough to enable the re-fitting of the shim into the bottom of the bearings.
- The top half cylinder assembly and HP rotor were then removed to enable the checking of the soft wire clearances.
- The top radial clearances were established from segment bore sizes, rotor diameters (see pages 5.23 to 5.26) and bottom soft wire clearances.

The HP radial and axial datums were taken as shown, see pages 5.2 to 5.5 inclusive on the HP Cylinder build check list.

The HP Inlet connection clearances pages 5.22 to be completed at site.

**D W Brown – Quality Technician
TURBINE MANUFACTURE
RUGBY WORKS**

RECORD SHEET ISSUE STATUS AND COMPLETION RECORD

CONTRACT: INTERMOUNTAIN	UNIT No: 1	ST No: T11246
CHECKLIST No: 1175		
SECTION No: 5	TITLE: HP CYLINDER WORKS BUILD	Sheet 1 of 1

PAGE No.	RECORD SHEET No.	DESCRIPTION	ISSUE	TS ENGR
1	HP20/001	HP Rotor bumping clearance & axial cold datums	A	
2	HP20/026	HP Inner cylinder/rotor axial datum - unboxed	A	
3	HP20/026	HP Inner cylinder/rotor axial datum - boxed	A	
4	HP20/027	HP Inner cylinder/rotor radial datum - unboxed	A	
5	HP20/027	HP Inner cylinder/rotor radial datum - boxed	A	
6	HP20/018	HP Rotor to inner casing vertical datums	A	
7 - 8	HP11/036	HP Diaphragm & wheel clearances	A	
9	HP11/035	HP Rotor to spill strip to shrouding clearances	A	
10	HP11/004	HP Diaphragm gland clearances	A	
11	HP10/003	HP Diaphragm gland stop plate clearances	A	
12	HP09/003	HP Diaphragm gland ring segment butt clearances	A	
13	HP12/001	HP Diaphragm to cylinder half joint steps	A	
14 - 15	HP13/008	HP Diaphragm key clearances	A	
16	HP14/004	HP Diaphragm to casing axial clearances	A	
17	HP02/005	HP inlet gland clearances	A	
18	HP04/004	HP Inlet gland stop plate clearances	A	
19	HP01/003	HP Inlet gland ring segment butt clearances	A	
20	HP08/001	HP Inlet gland to cylinder half joint steps	A	
21	HP05/014	HP Inlet gland key clearances	A	
22	HP27/015	HP Turbine steam inlet connection	A	
23	HP30/001	HP Rotor diameters/diaphragm bores/clearances	A	
24	HP30/002	HP Rotor diameters/diaphragm extension bores/clearances	A	
25 - 26	HP30/003	HP Rotor diameters/steam gland bores/clearances	A	
27	HP27/028	HP Bott inner cyl. inlets & key position measurements	A	
28	HP27/028	HP Top inner cyl. inlets & key position measurements	A	
29	HP20/028	HP Rotor to casing E RAG Datums - UNBOXED	A	

Title **HP ROTOR BUMPING CLEARANCE & AXIAL COLD DATUMS**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by *B. WILLIS, D. BLOW* Date *9/1/03* Supvr. *M. HUMPHRIES* Approv. *R. E. Rogers* Date *13/1/03*
G. HEMMING

Readings in inches

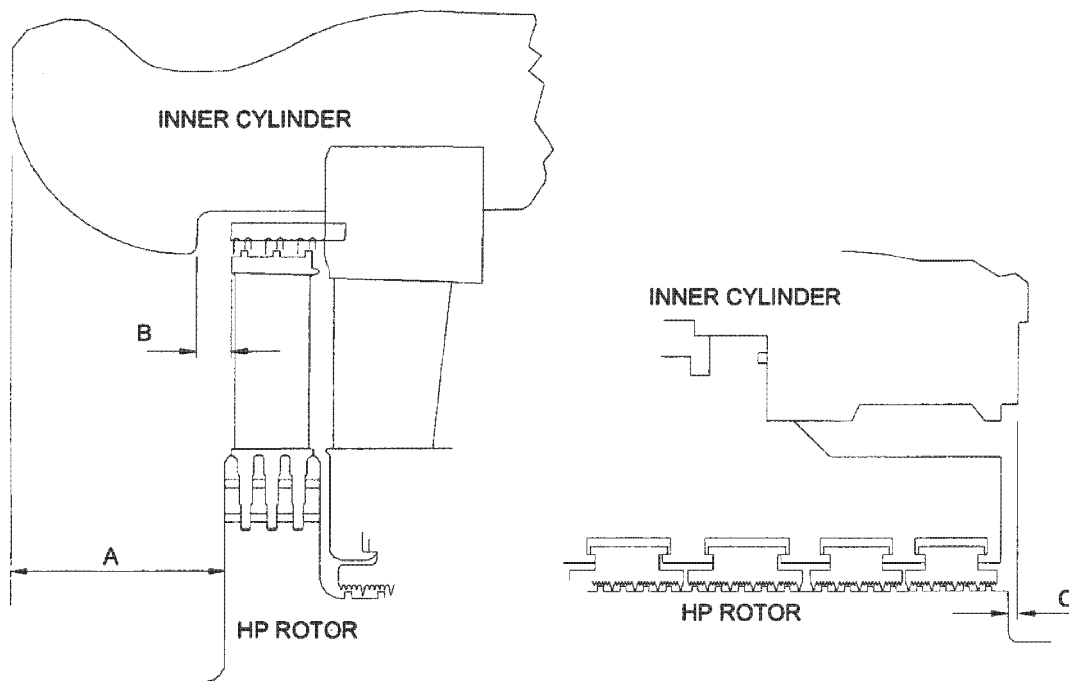
SHAFT IDENTIFICATION No.:	<i>R.F. 113218</i>
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CYLINDER CONDITION	UNBOXED	BOXED
ROTOR EXPANDING CLEARANCE	<i>.348</i>	<i>.352</i>
ROTOR CONTRACTING CLEARANCE	<i>.158</i>	<i>.158</i>
TOTAL FLOAT	<i>.506</i>	<i>.510</i>

EXTERNAL COLD DATUMS

FRONT-END <i>'B' READING PAGE 5.3</i>	L.H.S.	<i>.507</i>
	R.H.S.	<i>.504</i>
REAR-END <i>'C' READING PAGE 5.3</i>	L.H.S.	<i>1.057</i>
	R.H.S.	<i>1.055</i>

DISTANCE BETWEEN BACK FACE OF COUPLING AND No. BEARING HOUSING	<i>NOT APPLICABLE.</i>
POSITION AT WHICH READING WAS TAKEN	<i>REAR END DATUM R.H. SIDE, = 1.055"</i>

Title **HP INNER CYLINDER/ROTOR AXIAL DATUMS - UNBOXED**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by *G. HENNINGES* Date *8/1/03* Supvr. *M. HUMPHRIES* Approv. *R. Rogers* Date *13/1/03*

READINGS IN INCHES

	FRONT A		FRONT B		REAR C	
	SHOP	SITE	SHOP	SITE	SHOP	SITE
LHS	11.379		.505		1.057	
BOTT	11.382		.504		1.057	
RHS	11.378		.504		1.056	

Title

HP INNER CYLINDER/ROTOR AXIAL DATUMS - BOXED

Contract

INTERMOUNTAIN

Unit

1

Serial No.

T11246

Site Issue

A

Date

2/10/02

Checked

SDW

Check List No.

1175

Taken by

B. NILLIS, D. Brown
G. HENNINGES

Date 9/1/03

Supvr.

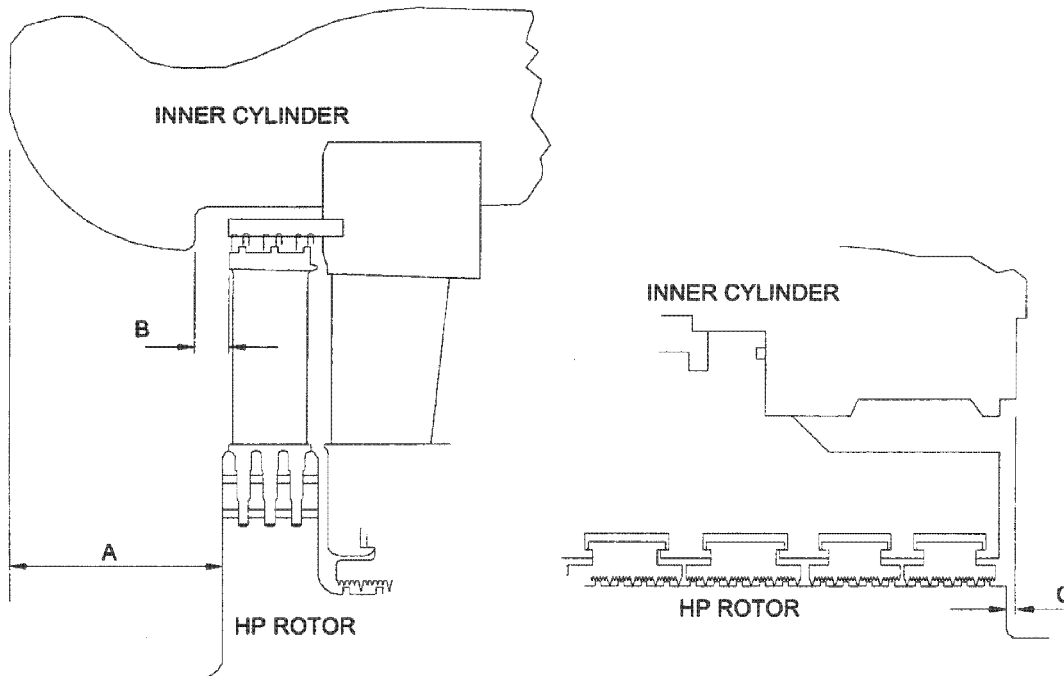
M. HUMPHRIES

Approv.

R. Pappas

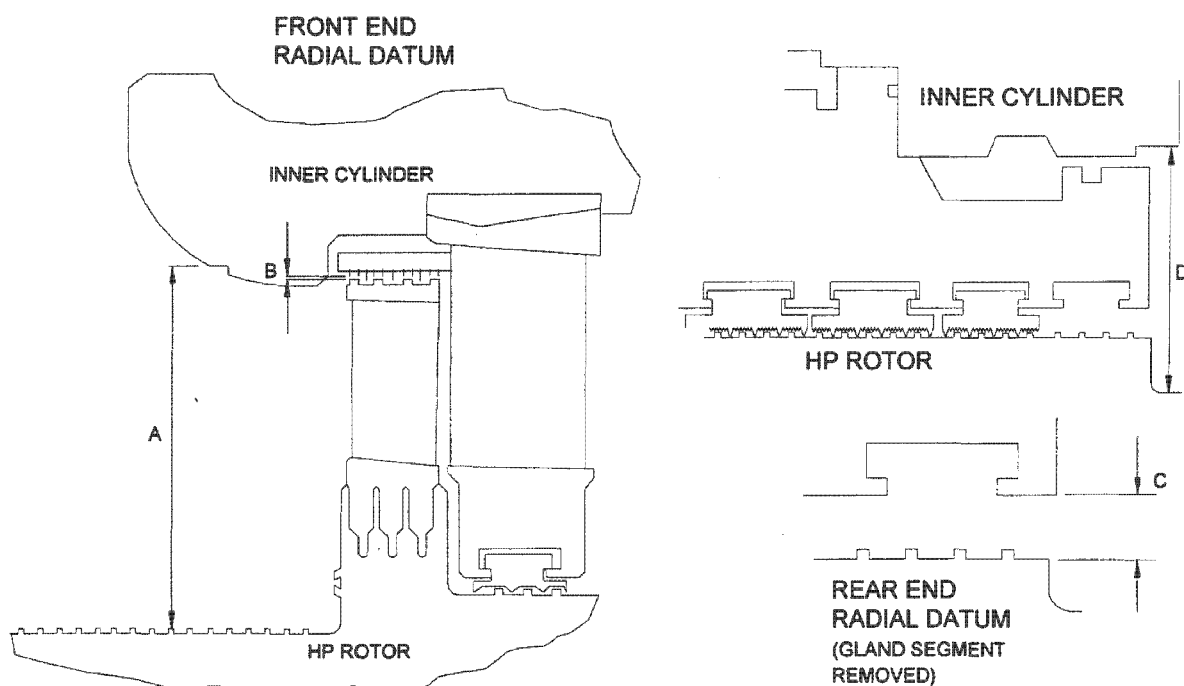
Date

13/1/03



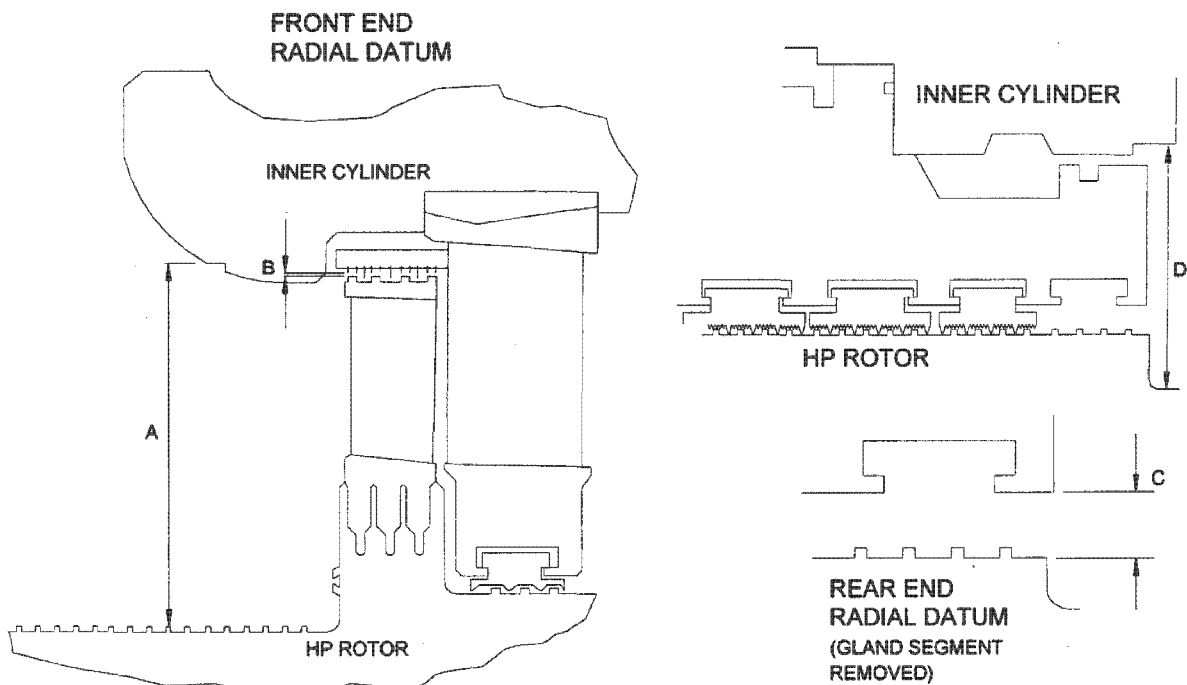
READINGS IN INCHES

	FRONT A		FRONT B		REAR C	
	SHOP	SITE	SHOP	SITE	SHOP	SITE
LHS	11.379		.507		1.057	
BOTT	N.R.		N.R.		N.R.	
RHS	11.378		.504		1.055	
TOP	N.R.		N.R.		N.R.	

Title **HP INNER CYLINDER/ROTOR RADIAL DATUMS - UNBOXED**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by **P. FRENCH - B. WILLIS** Date **8/1/03** Supvr. **M. HUMPHRIES** Approv. **R. Eger** Date **17/1/03**
G. HENNINGES

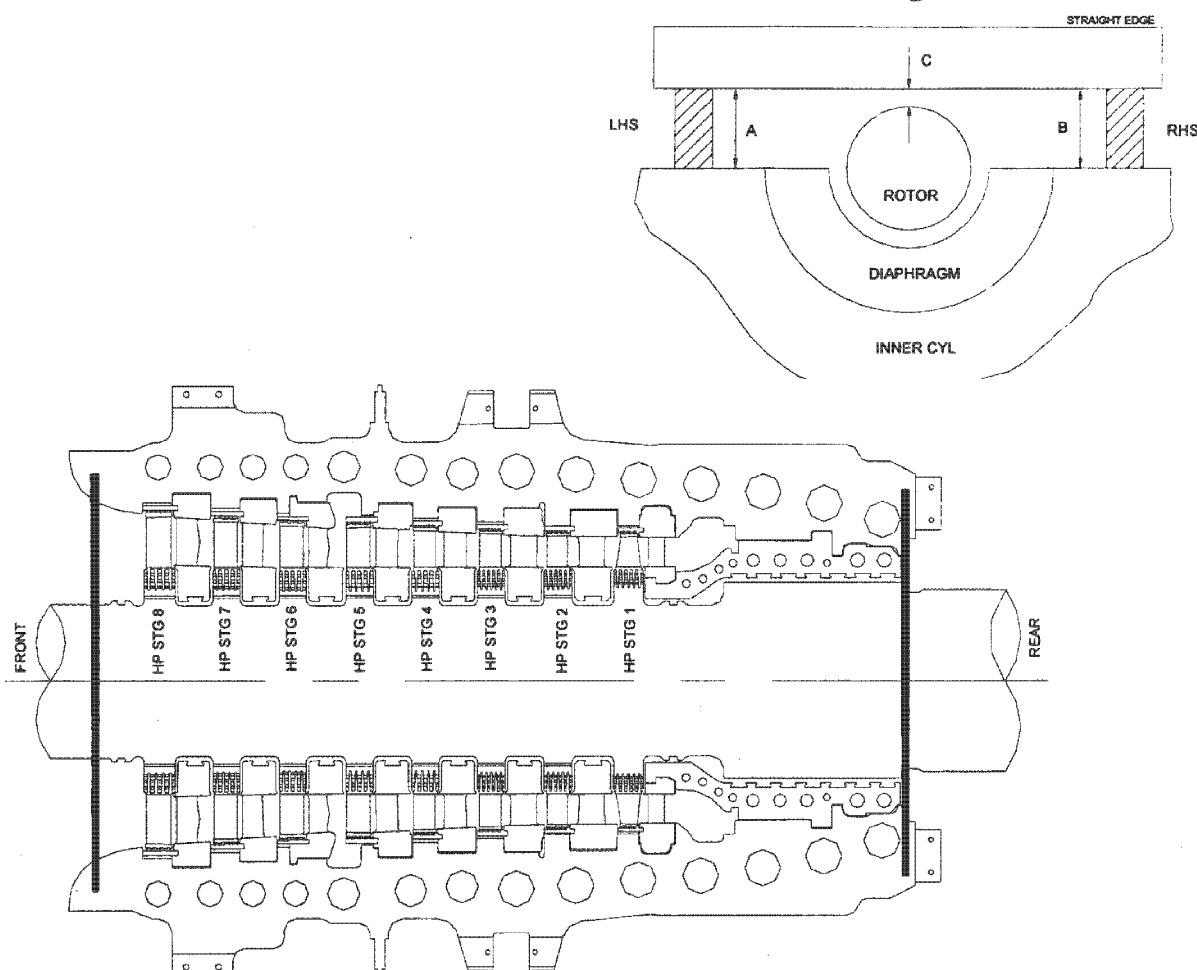
READINGS IN INCHES

	FRONT A		FRONT B		REAR C		REAR D	
	SHOP	SITE	SHOP	SITE	SHOP	SITE	SHOP	SITE
LHS	15.417		.034		.707		6.003	
BOTT	15.369		.028		.700		5.996	
RHS	15.405		.034		.705		6.002	

Title **HP INNER CYLINDER/ROTOR RADIAL DATUMS - BOXED**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by **B. IVILLIS D. BROWN** Date **9/1/03** Supvr. **M. HUMPHRIES** Approv. **R. Rogers** Date **17/1/03**
G. HEMMING

READINGS IN INCHES

	FRONT A		FRONT B		REAR C		REAR D	
	SHOP	SITE	SHOP	SITE	SHOP	SITE	SHOP	SITE
LHS <i>BOTT</i>	15.419		.032		.706		6.003	
BOTT	15.371		.030		.703		6.000	
RHS <i>BOTT</i>	15.408		.036		.706		6.002	
TOP	15.351		.029		.717		6.012	

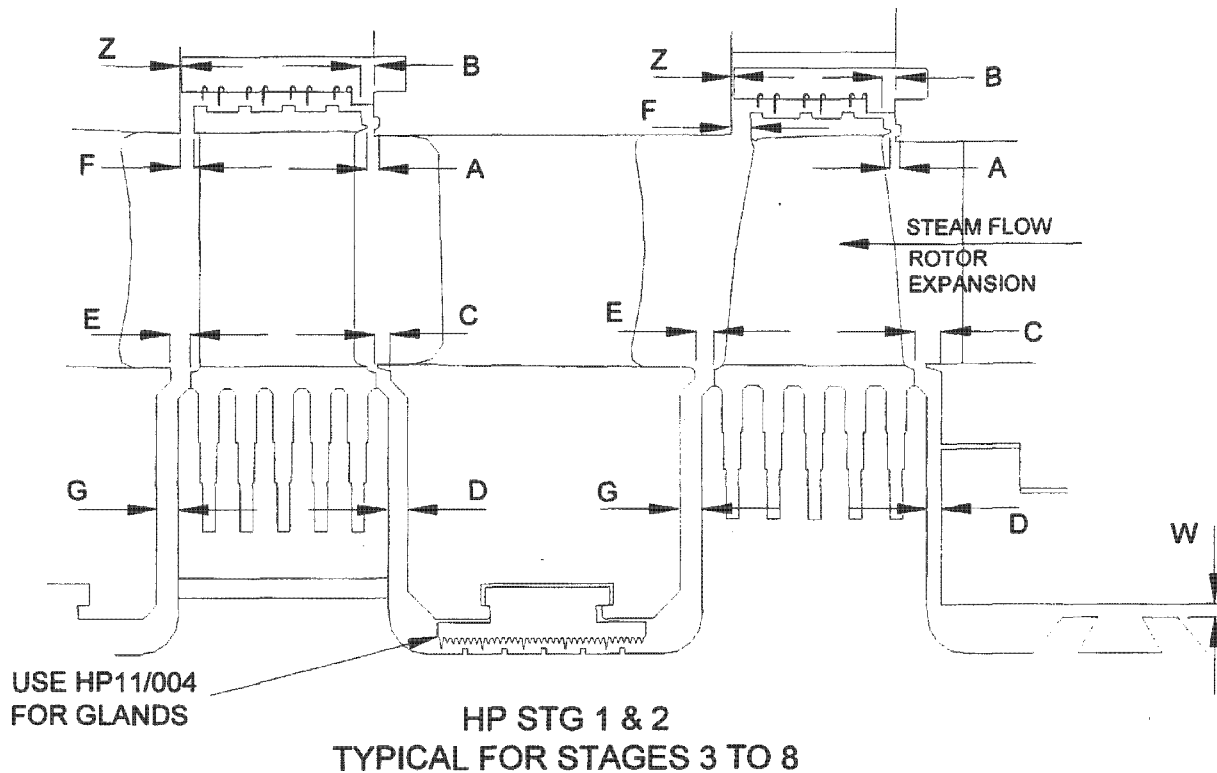
Title **HP/IP ROTOR TO CASING VERTICAL DATUMS - UNBOXED**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by **I. GREENFIELD**
S. SAWYER Date **8/1/03** Supvr. **M. HUMPHRIES** Approv. **R. ROY** Date **17/1/03**

Note: Vertical datum measurements taken with rotor / gland bottom build clearances established and without any compensation for bolt up distortion.

POSITION	A	B	C
HP Diaphragm St.8	13.934	13.934	2.190
HP inner casing rear end outer bore	13.9335	13.9335	0.455

Title **HP DISC TO DIAPHRAGM AXIAL & RADIAL CLEARANCES** Sht 1 of 2Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by _____ Date _____ Supvr. _____ Approv. *R. Regis* Date **6/1/03**

Ref. Drawing:- R277/1338 REV B



ALL CLEARANCES TO BE TAKEN WITH THE ROTOR IN THE AXIAL COLD SET POSITION.
MINIMUM CLEARANCE TO BE RECORDED.

Title

HP DISC TO DIAPHRAGM AXIAL & RADIAL CLEARANCES

Sht 2 of 2

Contract

INTERMOUNTAIN

Unit

1

Serial No.

T11246

Site Issue

A

Date

2/10/02

Checked

SDW

Check List No.

1175

Taken by

T. SEAGRAVE

Date

6/1/03

Supvr.

M. HUMPHRIES

Approv.

R. Rogers

Date

6/1/03

Ref. Drawing:- R277/1338 REV B

F=FRONT R=REAR

BLADING STAGE			8F	7	6	5	4	3	2	1R
A (RC)	DESIGN		.224				.221	.213	.197	.185
	ACTUAL	LHS	.232	.224	.213	.215	.217	.205	.206	.176
		RHS	.231	.230	.221	.212	.208	.203	.190	.168
B (RC)	DESIGN		.264				.260	.252	.236	.224
	ACTUAL	LHS	.265	.267	.259	.255	.264	.237	.233	.226
		RHS	.261	.261	.259	.255	.249	.242	.228	.218
C (RC)	DESIGN		.268		.287	.299	.295	.287	.283	.213
	ACTUAL	LHS	.273	.273	.296	.291	.286	.279	.285	.215
		RHS	.263	.275	.294	.296	.286	.284	.267	.210
D (RC)	DESIGN		.343		.366	.378	.382	.374		.276
	ACTUAL	LHS	.342	.335	.355	.361	.375	.364	.374	.264
		RHS	.331	.333	.352	.357	.362	.364	.364	.267
E (RE)	DESIGN		.634	.496	.484	.472	.453	.429	.406	
	ACTUAL	LHS	SITE	.482	.504	.466	.447	.418	.406	.405
		RHS	SITE	.496	.484	.469	.452	.424	.406	.405
F (RE)	DESIGN		.500	.496	.484	----	.453	.429	.406	
	ACTUAL	LHS	.505	.490	.484	----	.457	.422	.410	.415
		RHS	.504	.497	.486	----	.458	.434	.407	.413
G (RE)	DESIGN		.823	.547		.524	.504	.480	.457	
	ACTUAL	LHS	SITE	.537	.542	.521	.505	.474	.459	.453
		RHS	SITE	.547	.548	.524	.509	.486	.457	.459
Z	DESIGN		.039			1.496	.039			
	ACTUAL	LHS	.044	.041	.039	1.495	.050	.027	.064	.040
		RHS	.041	.038	.037	1.500	.041	.040	.039	.041
W	DESIGN		----	----	----	----	----	----	----	.315
	ACTUAL	LHS	----	----	----	----	----	----	----	.309
		RHS	----	----	----	----	----	----	----	.316

Title

HP ROTOR SPILL STRIP TO SHROUDING CLEARANCES

Contract

INTERMOUNTAIN

Unit

1

Serial No.

T11246

Site Issue

A

Date

2/10/02

Checked

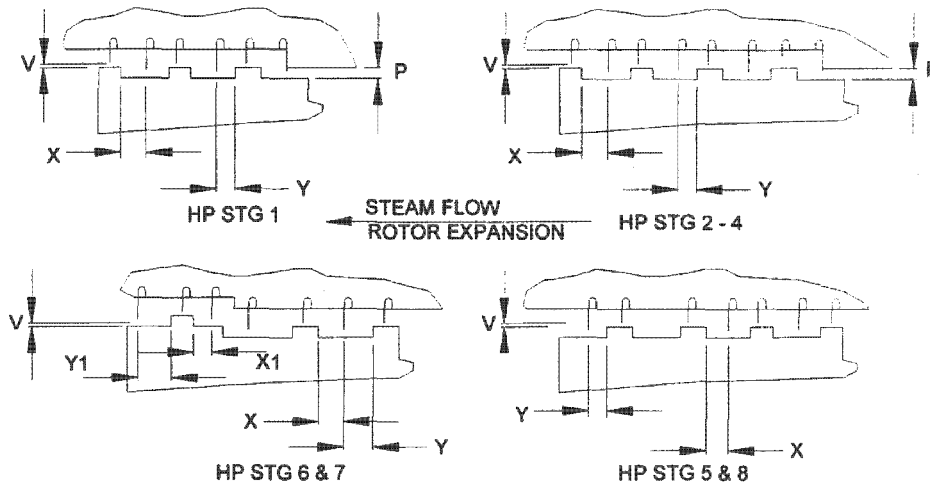
SDW

Check List No.

1175

Taken by *B. WILLIS B. Fox*
*B. FARREN*Date *6/1/03*Supvr. *M. HUMPHRIES*Approv. *R. Rogers*Date *7/1/03*

Ref. Drawing:- R277/1338 REV B

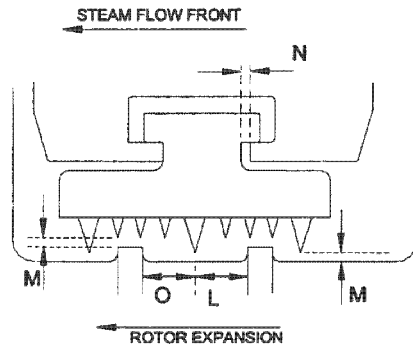


F=FRONT R=REAR

DISC STAGE		HP8F	HP7	HP6	HP5	HP4	HP3	HP2	HP1R
V	DESIGN	.031	.030	.028	.028	.028	.028	.043	.0R28
	TOP ACT	.037	.031	.030	.029	.030	.028	.048	.029
	BOT ACT	.033	.035	.032	.033	.032	.034	.045	.034
	LHS ACT	.035	.033	.031	.032	.033	.032	.047	.034
	RHS ACT	.036	.033	.031	.029	.030	.030	.048	.033
P	DESIGN	----	----	----	----	0.047	0.047	0.063	0.047
	TOP ACT	----	----	----	----	.051	.052	.055	.048
	BOT ACT	----	----	----	----	.052	.054	.051	.055
	LHS ACT	----	----	----	----	.057	.057	.068	.067
	RHS ACT	----	----	----	----	.058	.061	.071	.068
X (RC)	DESIGN	.244	.315	.354	.240	.240	.240	.220	.228
	LHS ACT	.245	.295	.344	.225	.244	.230	.220	.219
	RHS ACT	.247	.308	.346	.230	.234	.230	.206	.212
X1 (RC)	DESIGN	----	.276	.236	----	----	----	----	----
	LHS ACT	----	.300	.227	----	----	----	----	----
	RHS ACT	----	.300	.230	----	----	----	----	----
Y (RE)	DESIGN	.476	.563	.610	.429	.421	.421	.385	.441
	LHS ACT	.475	.596	.622	.442	.410	.436	.381	.455
	RHS ACT	.484	.577	.622	.453	.425	.424	.412	.442
Y1 (RE)	DESIGN	----	.488	.437	----	----	----	----	----
	LHS ACT	----	.510	.464	----	----	----	----	----
	RHS ACT	----	.488	.460	----	----	----	----	----

Title **HP DIAPHRAGM GLAND CLEARANCES (CASTELLATED ROTOR)**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by **T. SGAORAVE**
B. Fex Date **4/1/03** Supvr. **M. HEMPHERIES** Approv. **R. Rogers** Date **6/1/03**

Ref. Drawing:- R277/1338 REV B



ALL CLEARANCES TO BE TAKEN WITH ROTOR IN AXIAL COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.**RC** REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

F=FRONT R=REAR

STAGE		8F	7	6	5	4	3	2R
L (RE)	DESIGN	.454	.423	.403	.423		.364	.365
	ACT	LHS	.448	.431	.408	.427	.415	.369
		RHS	.458	.427	.406	.422	.421	.368
O (RC)	DESIGN	.277	.230	.250	.309		.289	.290
	ACT	LHS	.282	.220	.238	.300	.312	.285
		RHS	.269	.218	.238	.302	.307	.290
M	TOP	DES	.024					
		ACT	.023	.021	.026	.024	.027	.024
	BOTT	DES	.024					
		ACT	.024	.024	.024	.024	.023	.024
	LHS	DES	.024					
		ACT	.027	.024	.026	.024	.024	.024
	RHS	ACT	.024	.022	.024	.024	.024	.023
N	DESIGN		.016					
	ACT	LHS	.014	.015	.014	.016	.014	.014
		RHS	.014	.015	.014	.015	.014	.014

Title

HP DIAPHRAGM GLAND STOP PLATE CLEARANCES

Contract

INTERMOUNTAIN

Unit

1

Serial No.

T11246

Site Issue

A

Date

2/10/02

Checked

SDW

Check List No.

1175

Taken by

R. MITCHELL D. CARTER
D. RANDALL K. WAKEHAM

Date

31/12/02

Supvr. S. JOHNSON

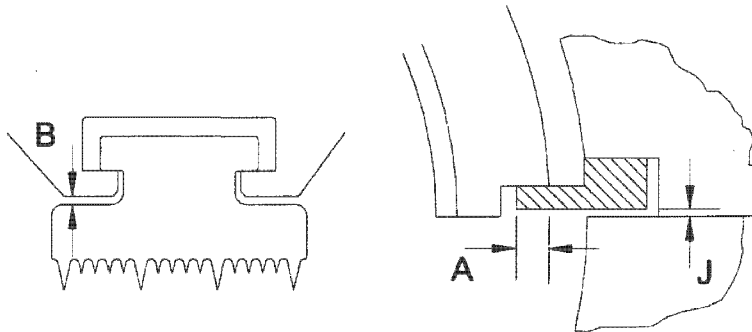
Approv.

R. Rapp

Date

31/1/03

Ref. Drawing:- R265/9371 - 9378

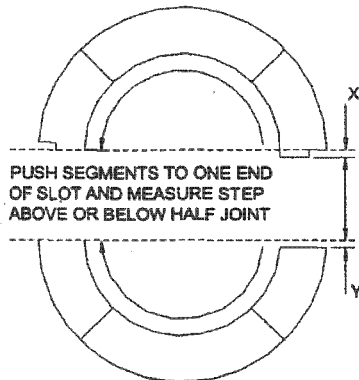


F=FRONT R=REAR

DIAPHRAGM STAGE NUMBER	RING NUMBER	A (DESIGN = .120 MIN)		B		J (DESIGN = .008 MIN)	
		L.H.S	R.H.S	L.H.S	R.H.S	L.H.S	R.H.S
2R	1	.118	.118	.114	.114	.040	.040
3	1	.118	.118	.112	.112	.027	.027
4	1	.118	.138	.114	.114	.014	.010
5	1	.118	.118	.114	.114	.080	.047
6	1	.118	.118	.113	.113	.027	.027
7	1	.118	.118	.120	.120	.040	.040
8F	1	.126	.126	.114	.114	.063	.063

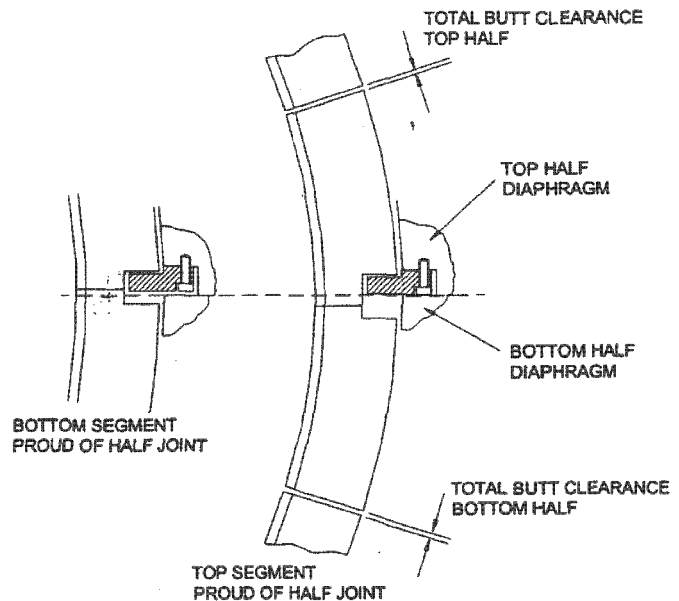
Title **HP DIAPHRAGM GLAND RING SEGMENT BUTT CLEARANCE**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by R. MITCHELL D. CARTER Date 3/12/02 Supvr. S. JOHNSON Approv. RE Rago Date 6/1/03
D. RANDALL K. WAKEMAN

Ref. Drawing:- R265/9371 - 9378 ALL REV. A



BOTTOM OF STOP PLATES TO BE ADJUSTED EQUALLY IF BOTTOM SEGMENT IS PROUD OF THE HALF JOINT (SEE STOP PLATE CLEARANCE SHEET)

AT REQUEST OF TURBOCARES, REP, A 0.063" CLAEURANCE HAS BEEN INTRODUCED BETWEEN STOP PLATE AND T.H. SEGMENTS.



NOTE + SIGN TO INDICATE SEGMENTS PROUD OF DIAPHRAGM HALF JOINT.

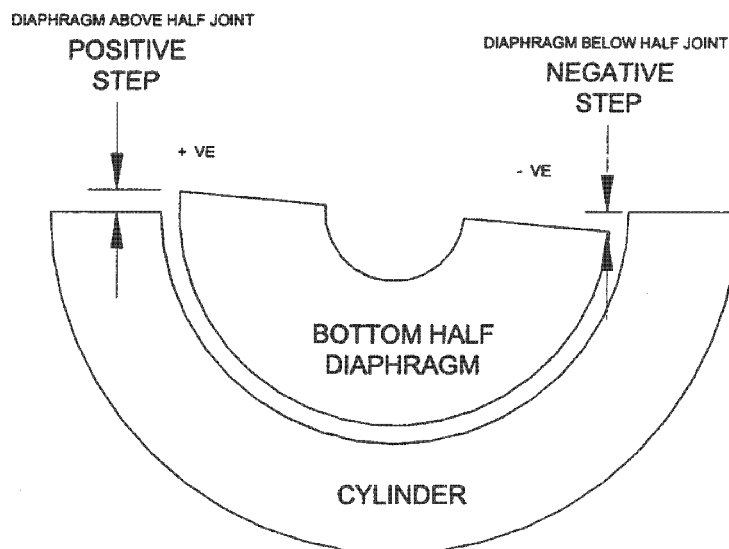
- SIGN TO INDICATE SEGMENTS BELOW DIAPHRAGM HALF JOINT.

* B TOTAL BUTT CLEARANCE = SUM TOP & BOTT HALF STEPS PLUS INNER JOINT GAPS

(F= front end, R= rear end)

Readings in inches

STAGE	TOP HALF STEP (+/-)	BOT HALF STEP (+/-)	TOTAL BUTT PER RING SUM(X & Y)	DIAPHRAGM INNER RING JOINT GAP		DESIGN TOTAL PER RING	
	X	Y	B*	LH	RH		
2R	+ .001	- .001	.016	.008	.008	0.008/0.020	.016
3	+ .002	+ .002	.012	.008	.008		.012
4	+ .004	+ .006	.010	.010	.010		.010
5	- .002	- .002	.020	.008	.008		.020
6	+ .004	.000	.014	.010	.008		.014
7	- .002	- .002	.020	.008	.008		.020
8F	+ .006	.000	.014	.012	.008		.014

Title **HP DIAPHRAGM TO CYLINDER HALF JOINT STEPS**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by *B. Willis*
B. Fox Date *4/1/03* Supvr. *M. Humphries* Approv. *R. Rogers* Date *6/1/03*

POSITION AT WHICH READINGS ARE TAKEN TO BE MARKED 'X'

F=FRONT R=REAR

DIAPHRAGM STAGE	BOTTOM HALF STEP READINGS	
	LHS	RHS
1R	+ .001	+ .002
2	- .009	- .010
3	- .001	- .003
4	- .005	- .007
5	- .018	- .018
6	- .008	- .008
7	- .002	- .002
8F	- .010	- .009

NOTE: + SIGN INDICATES BUSH PROUD OF CYLINDER HALF JOINT
 - SIGN INDICATES BUSH BELOW CYLINDER HALF JOINT

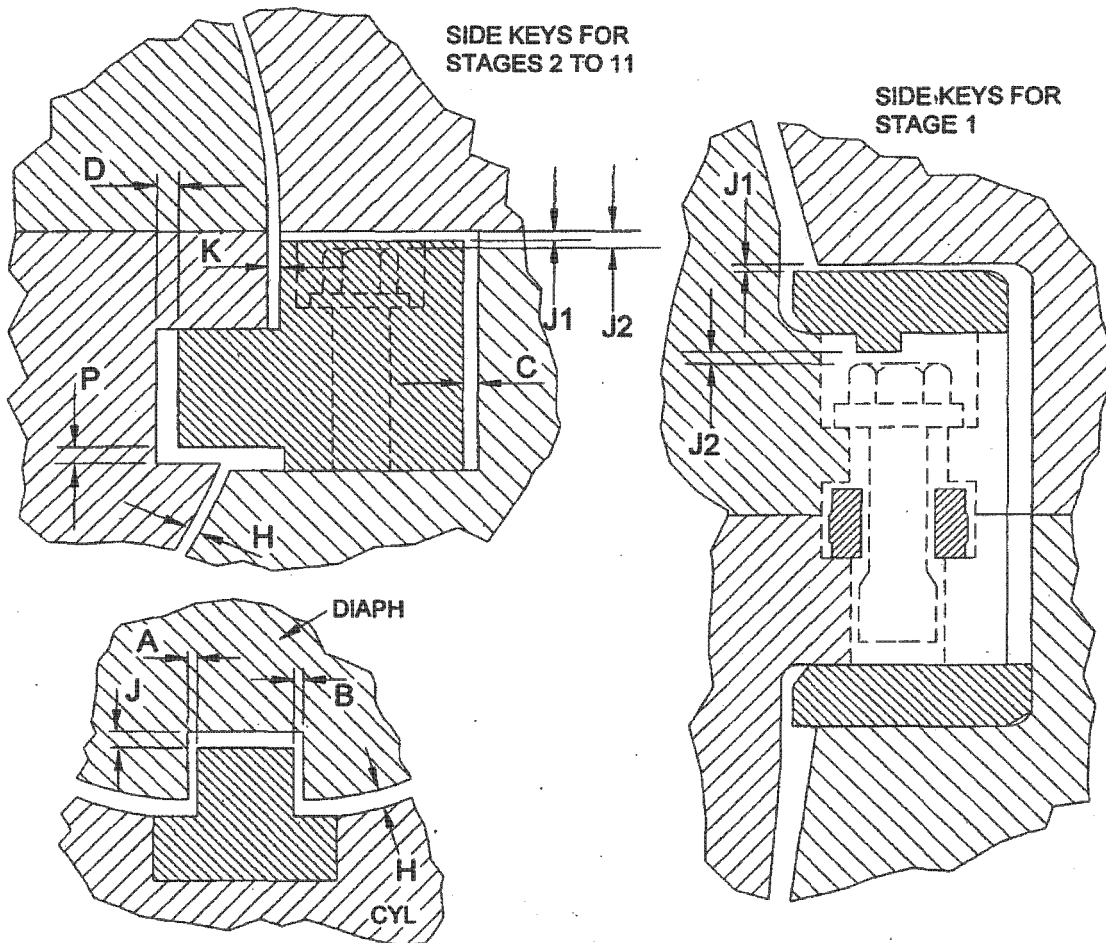
Title **HP DIAPHRAGM KEY CLEARANCES** Sht 1 of 2

Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**

Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**

Taken by _____ Date _____ Supvr. _____ Approv. *RE Rego* Date *10/1/03*

Ref. Drawing:- R265/9371 - 9378



Title

HP DIAPHRAGM KEY CLEARANCES

Sht 2 of 2

Contract

INTERMOUNTAIN

Unit

1

Serial No.

T11246

Site Issue

A

Date

2/10/02

Checked

SDW

Check List No.

1175

Taken by

K HUMPHRIES B. Fox
C.O. Burke B. Willis

Date

8/1/03

Supvr. M. Humphries

Approv.

R. Rogers

Date

10/1/03

Ref. Drawing:- R265/9371 - 9378

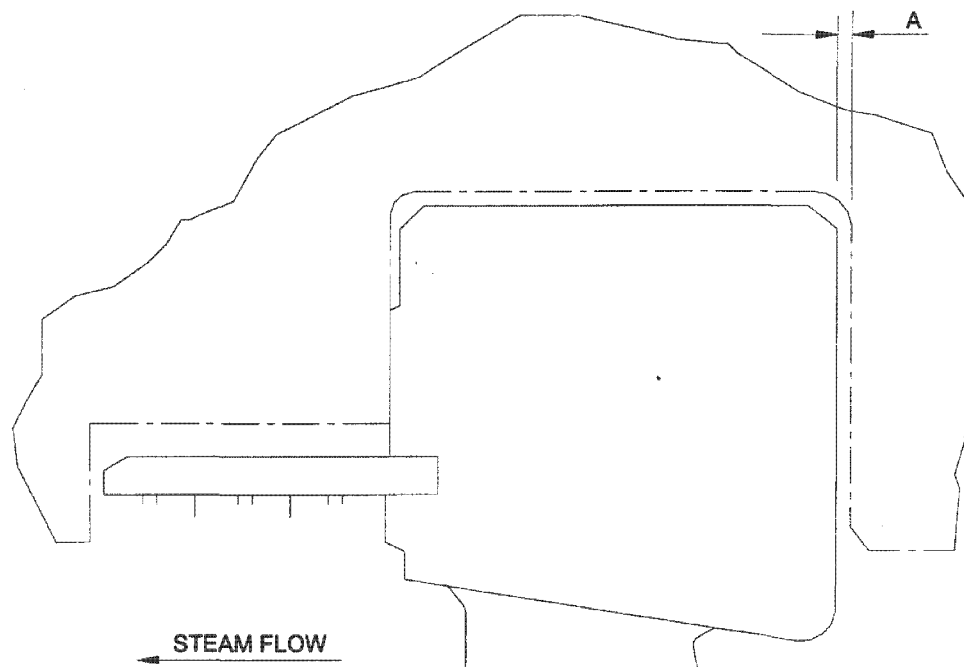
F=FRONT R=REAR

SIDE SUPPORT KEYS		STAGE							
		1R	2	3	4	5	6	7	8F
C	DESIGN	----	0.020						
	LHS	----	.020	.020	.020	.020	.020	.020	.020
	RHS	----	.020	.020	.020	.020	.020	.020	.020
D	DESIGN	----	0.138 ±.030			0.118 ±.030			
	LHS	----	.110	.108	.112	.108	.102	.093	.093
	RHS	----	.108	.113	.111	.097	.097	.093	.092
J1	DESIGN	.008/.012	0.001 / 0.002						
	LHS	.009	.001	.001	.001	.001	.001	.001	.001
	RHS	.010	.0005	.0005	.002	.001	.001	.001	.001
J2	DESIGN	0.008 MIN	0.064						
	LHS	.025	.062	.063	.073	.072	.067	.058	.061
	RHS	.026	.069	.068	.067	.076	.068	.063	.067
K	DESIGN	----	0.140 ±.030			0.120 ±.030			
	LHS	----	.169	.163	.161	.145	.144	.142	.154
	RHS	----	.163	.156	.164	.135	.139	.130	.154
P	DESIGN		0.0005 / 0.003						
	LHS	-	.0015	.002	.0005	.0005	.001	.0015	.0005
	RHS	-	.0015	.002	.0005	.0005	.001	.0005	.0025
H (TOP HALF)	DESIGN		0.138 ±.030			0.118 ±.030			
	-	-	-	-	-	-	-	-	-
	T.D.C.	.166	.145	.145	.148	.131	.131	.124	.136
H (BOT HALF)	DESIGN		0.138 ±.030			0.118 ±.030			
	LHS	.112	.110	.108	.112	.108	.090	.093	.093
	RHS	.108	.108	.113	.111	.097	.093	.089	.092

TOP & BOTTOM KEYS		STAGE							
		1	2	3	4	5	6	7	8
J	DESIGN	0.138 ±.030				0.118 ±.030			
	BOT	.141	.143	.146	.137	.122	.126	.112	.112
A + B	DESIGN	0.001 / 0.004							
	BOT	.002	.002	.003	.003	.0025	.0035	.0025	.0035
H	DESIGN	0.140 ±.030				0.120 ±.030			
	BOT	.173	.157	.164	.169	.146	.140	.143	.163

Title **HP DIAPHRAGM TO CASING AXIAL CLEARANCE**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by *S. SAWYER*
L. DAVIES Date *3/1/03* Supvr. *M. HUMPHRIES* Approv. *R. Regier* Date *6/1/03*

Ref. Drawing:- R265/9371 - 9378



F=FRONT R=REAR

STAGE	DESIGN	BOTTOM HALF DIAPHRAGMS	
		LHS	RHS
1R	0.016 / 0.022	- 016	- 016
2		- 020	- 020
3		- 020	- 020
4		- 020	- 022
5		- 022	- 023
6		- 022	- 022
7		- 017	- 017
8F		- 017	- 016

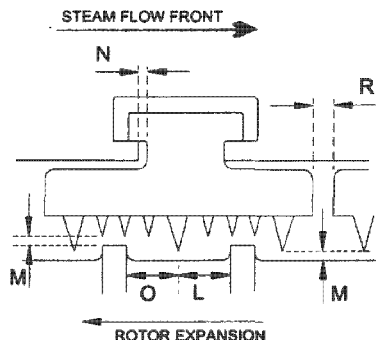
Title **HP INLET GLAND CLEARANCES (CASTELLATED ROTOR)**

Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**

Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**

Taken by *T. Seacave* Date *6/1/03* Supvr. *M. Humphries* Approv. *R. Lopez* Date *7/1/03*
B. Willis, B. Fox

Ref. Drawing:- R277/1338 REV B



ALL CLEARANCES TO BE TAKEN WITH ROTOR IN AXIAL COLD SET POSITION.

MINIMUM CLEARANCE TO BE RECORDED.

SEGMENTS TO BE PUSHED IN DIRECTION OF STEAM FLOW.

RE REDUCES WHEN ROTOR EXPANDS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

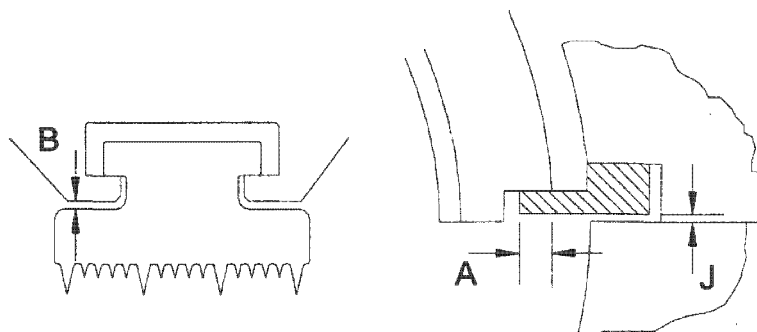
RC REDUCES WHEN ROTOR CONTRACTS FASTER THAN CASING WITH THRUST AS FIXED DATUM.

F=FRONT R=REAR

GLAND RING No.		C1F	C2	C3	C4	C5	C6	C7R
L (RE)	DESIGN	.332						
	ACT	LHS	.331	.332	.330	.328	.330	.329
		RHS	.328	.322	.327	.326	.325	.327
O (RC)	DESIGN	.163						
	ACT	LHS	.161	.167	.162	.157	.159	.158
		RHS	.158	.162	.157	.157	.157	.157
M	TOP	DES	.024					
		ACT	.023	.024	.024	.021	.023	.027
	BOTT	DES	.024					
		ACT	.023	.023	.022	.025	.023	.022
	LHS	DES	.024					
		ACT	.022	.022	.023	.022	.023	.024
	RHS	ACT	.023	.023	.023	.022	.022	.022
N	DESIGN	.016						
	ACT	LHS	.016	.015	.015	.014	.014	.017
		RHS	.015	.014	.014	.013	.014	.016
R	DESIGN	.039						-----
	ACT	LHS	.038	.038	.040	.040	.040	-----
		RHS	.038	.038	.040	.040	.040	-----

Title **HP INLET GLAND STOP PLATE CLEARANCES - CENTRE GLAND**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by *R. GREEN J. BRENNAN* Date *31/12/02* Supvr. *M. HUMPHRIES* Approv. *R. Rogers* Date *3/01/03*
T. SEARDAVE

Ref. Drawing:- R212/3856 REV A

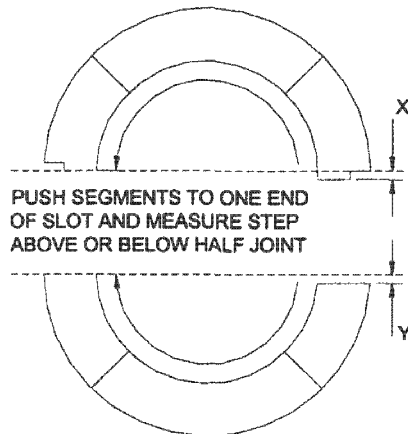


F=FRONT R=REAR

GLAND NUMBER	RING NUMBER	A (DESIGN = .120 MIN)		B		J (DESIGN = .008 MIN)	
		L.H.S	R.H.S	L.H.S	R.H.S	L.H.S	R.H.S
C1 F	1	.290	.285	.116	.115	.013	.016
C2	2	.290	.290	.117	.115	.022	.019
C3	3	.300	.290	.117	.115	.014	.020
C4	4	.290	.290	.117	.115	.022	.025
C5	5	.300	.305	.117	.116	.015	.017
C6	6	.280	.290	.118	.115	.017	.017
C7 R	7	.300	.290	.118	.115	.017	.014

Title **HP INLET GLAND RING SEGMENT BUTT CLEARANCE**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by **R. GREEN J. BENNAN** Date **3/12/02** Supvr. **M. HUMPHRIES** Approv. **R. L. RAY** Date **3/1/03**

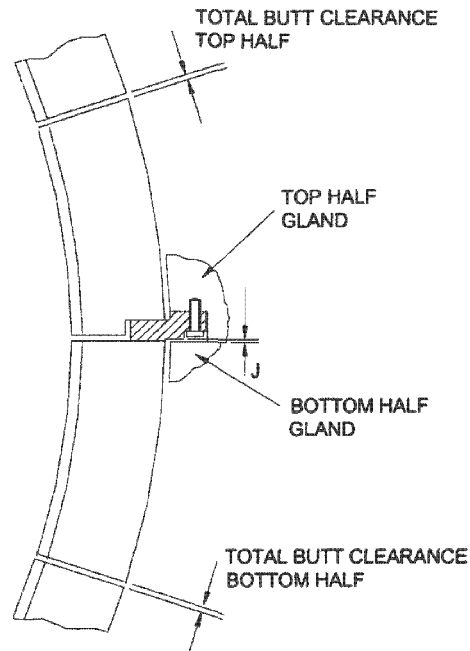
Ref. Drawing:- R212/3856 REV A



BUTT CLEARANCE BETWEEN GLAND SEGMENTS IN TOP HALF IS OBTAINED BY ADJUSTING TOP FACE OF BOTH STOP PLATES.

BOTTOM HALF BUTT CLEARANCE IS OBTAINED BY ADJUSTING THE END OF A BOTTOM HALF SEGMENT.

CLEARANCE 'J' IS OBTAINED BY ADJUSTING BOTTOM OF STOP PLATES.

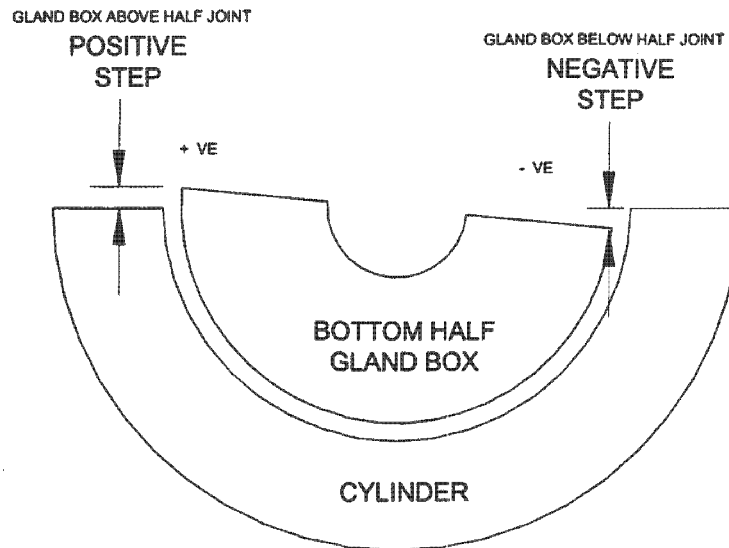


NOTE + SIGN TO INDICATE SEGMENTS PROUD OF GLAND HALF JOINT.
- SIGN TO INDICATE SEGMENTS BELOW GLAND HALF JOINT.

(F= front end, R= rear end)
Readings in inches

IF BOTTOM HALF STEP EXCEEDS DESIGN CLEARANCE FOR "J", THEN STOP PLATE MUST BE STEPPED.

STAGE	TOP HALF STEP (+/-)	BOT HALF STEP (+/-)	STOP PLATE TO BOT HALF GLAND. CLEARANCE 'J'			TOTAL TOP HALF BUTT CLEARANCE		TOTAL BOTTOM HALF BUTT CLEARANCE	
	X	Y	DESIGN	LHS	RHS	DESIGN	ACTUAL	DESIGN	ACTUAL
C1 F	-006	-011	.008 / .100	.013	.016	.004 / .010	.009	.004 / .010	.008
C2	-006	-011		.022	.019		.009		.008
C3	-008	-008		.014	.020		.008		.008
C4	-009	-011		.022	.025		.009		.011
C5	-007	-011		.015	.017		.008		.010
C6	-006	-012		.017	.017		.009		.009
C7 R	-004	-012		.017	.014		.008		.008

Title **HP INLET GLAND CARRIER TO CYLINDER HALF JOINT STEPS**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by *B. WILLIS*
B. FOX Date *8/1/03* Supvr. *M. HUMPHRIES* Approv. *R. Rogers* Date *10/1/03*

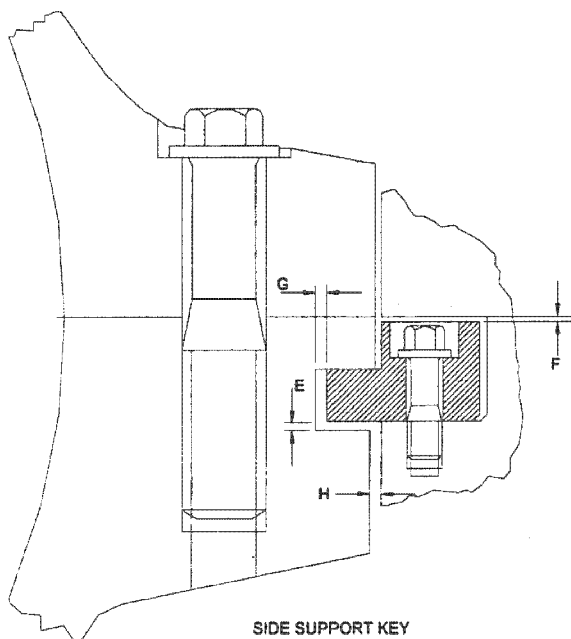
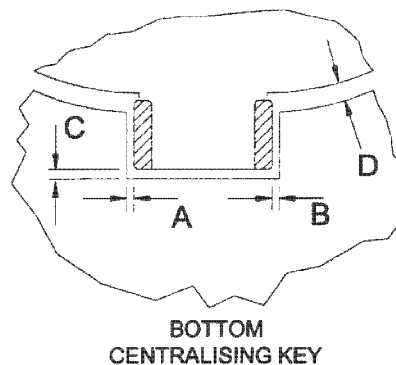
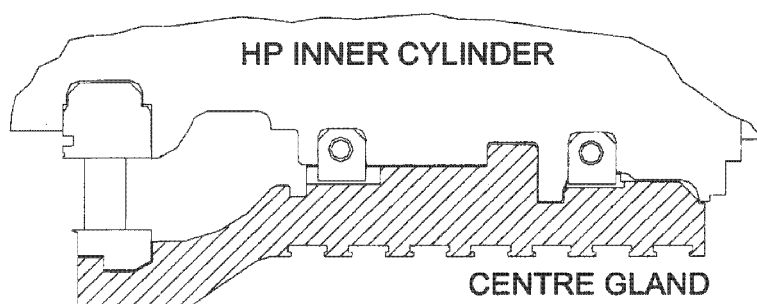
POSITION AT WHICH READINGS ARE TAKEN TO BE MARKED 'X'

GLAND BUSH NUMBER/POSITION	BOTTOM HALF STEP READINGS	
	LHS	RHS
BOX 'C' FRONT	- .002	- .001
BOX 'C' REAR	- .003	- .001

NOTE: + SIGN INDICATES BUSH PROUD OF CYLINDER HALF JOINT
 - SIGN INDICATES BUSH BELOW CYLINDER HALF JOINT

Title **HP INLET GLAND CARRIER**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by *K. HUMPHRIES*
C.O. ROURKE Date *8/1/03* Supvr. *M. HUMPHRIES* Approv. *R. Rago* Date *10/1/03*

Ref. Drawing:- R212/3856 REV A



SIDE SUPPORT KEYS				
POSITION	E	F	G	H
DESIGN	0.0004/ 0.003	0.001/ 0.002	0.118 ±.030	0.118
FRONT LHS	.0015	.002	.133	.096
FRONT RHS	.002	.002	.123	.095
REAR LHS	.0025	.002	.127	.096
REAR RHS	.002	.002	.124	.095

CENTRALISING KEY			
POSITION	A + B	C	D
DESIGN	0.002/.004	0.394	0.118 ±.030
ACTUAL	.004	.425	.125

Title

HP TURBINE STEAM INLETS

Contract

INTERMOUNTAIN

Unit

1

Serial No.

T11246

Site Issue

A

Date

2/10/02

Checked

SDW

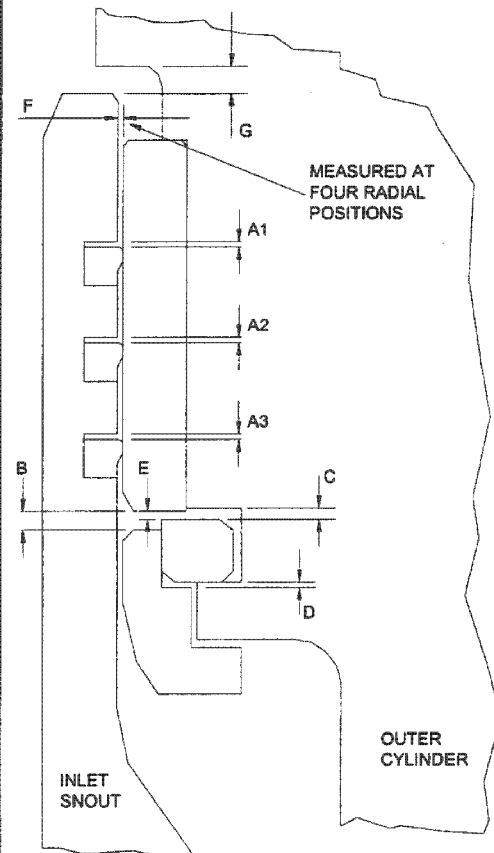
Check List No.

1175

Taken by *S. SANDS*
*S. MILES*Date *7/1/03*Supvr. *M. HUMPHRIES*Approv. *R. Rogers*Date *10/1/03*

Ref. Drawing:- R202/5396 REV A

HP CYLINDER INLETS					
POSITION	DESIGN	LHS TOP	RHS TOP	LHS BOTT	RHS BOTT
A1	.020 / .027	<i>-.022</i>	<i>-.021</i>	<i>-.022</i>	<i>-.022</i>
A2		<i>-.022</i>	<i>-.022</i>	<i>-.021</i>	<i>-.022</i>
A3		<i>-.022</i>	<i>-.022</i>	<i>-.021</i>	<i>-.022</i>
B	.035 / .055	SITE READINGS			
C	.004 / .008				
D	.024 / .040				
E	.006 / .016				
F FRONT	.118				
F REAR					
F I/BRD	.118				
F O/BRD					
G	.315 / .472	SITE READINGS			
SEALING RING BUTT CL'R/C.	DESIGN	.185 / .205			
	1	<i>-.212</i>	<i>-.199</i>	<i>-.209</i>	<i>-.206</i>
	2	<i>-.204</i>	<i>-.216</i>	<i>-.197</i>	<i>-.201</i>
	3	<i>-.206</i>	<i>-.200</i>	<i>-.206</i>	<i>-.207</i>

NOTE:-

'F' READING TOTAL DIMETRICAL CLEARANCE WHICH WAS OBTAINED FROM MEASURED MATING COMPONENTS IS .240". ACTUAL RADIAL CLEARANCE TO BE DETERMINED AT SITE.

Title

HP ROTOR DIAMETERS/DIAPHRAGM BORES/CLEARANCES

Contract

INTERMOUNTAIN

Unit

1

Serial No.

T11246

Site Issue

A

Date

2/10/02

Checked

SDW

Check List No.

1175

Taken by

R. MITCHELL K. WAKEHAM
D. RANDALL B. PLATT

Date

2/1/03

Supvr.

M. HUMPHRIES

Approv.

RE RAY

Date

3/1/03

Ref. Drawing:- R277/1338 REV A

L = LARGE Dia.. S = Small Dia. SF = Short Fins. LF = Long Fins

STAGE	ROTOR DIAMETER		DIAPHRAGM GLAND BORE		TOTAL CLEARANCE	DESIGN CLEARANCE
2 R	L	23.228	SF	23.298	.070	.066
	S	22.991	LF	23.061	.070	
3	L	23.228	SF	23.277	.049	.048
	S	22.991	LF	23.041	.050	
4	L	23.227	SF	23.279	.052	.048
	S	22.991	LF	23.043	.052	
5	L	23.226	SF	23.276	.050	.048
	S	22.990	LF	23.039	.049	
6	L	23.227	SF	23.278	.051	.048
	S	22.991	LF	23.041	.050	
7	L	23.228	SF	23.276	.048	.048
	S	22.991	LF	23.039	.048	
8 F	L	23.227	SF	23.275	.048	.048
	S	22.991	LF	23.039	.048	

Title **HP ROTOR DIAMETERS/DIAPHRAGM EXTENS BORES/CLEARANCES**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**

Taken by *B. P. M. M. PORTER R. RINZ* Date *2/1/03* Supvr. *M. HUMPHRIES* Approv. *R. Rogers* Date *3/1/03*
W. HESLER M. BROWNE

Ref. Drawing:- R277/1338 REV A

L = LARGE Dia.. S = Small Dia. SF = Short Fins. LF = Long Fins

STAGE	ROTOR DIAMETER		DIAPHRAGM EXTENSION BORE (TOP TO BOTTOM)		TOTAL CLEARANCE	DESIGN CLEARANCE
1 R	S	44.644	LF	44.707	.063	.056
	L	44.878	SF	44.943	.065	
2	S	44.960	LF	45.053	.093	.086
	L	45.192	SF	45.289	.097	
3	S	45.629	LF	45.692	.063	.056
	L	45.865	SF	45.928	.063	
4	S	46.653	LF	46.715	.062	.056
	L	46.886	SF	46.951	.065	
5	L	47.756	SF	47.817	.061	.056
	S	47.991	LF	48.054	.063	
6	L	48.620	SF	48.683	.063	.056
	S	48.384	LF	48.447	.063	
	L	48.384	SF	48.447	.063	.056
	S	48.150	LF	48.211	.061	
7	L	49.958	SF	50.025	.067	.060
	S	49.722	LF	49.789	.067	
	L	49.722	SF	49.788	.066	.060
	S	49.486	LF	49.552	.066	
8 F	L	51.613	SF	51.684	.071	.062
	S	51.376	LF	51.448	.072	

Title

HP ROTOR DIAMETERS/STEAM GLAND BORES/CLEARANCES

Contract INTERMOUNTAIN Unit 1 Serial No. T11246

Site Issue A Date 2/10/02 Checked SDW Check List No. 1175

Taken by *M. ASHWIN R. ADAMS* Date *4/1/03* Supvr. *M. HUMPHRIES* Approv. *R. Rogers* Date *6/1/03*
J. FITZGERALD R. GREEN

Ref. Drawing:- R277/1338 REV A

L = LARGE Dia., S = Small Dia. SF = Short Fins. LF = Long Fins

STAGE	RING	ROTOR DIAMETER	STEAM GLAND BORE	TOTAL CLEARANCE	DESIGN CLEARANCE
A FRONT	1F	L 19.978	SF -----	-----	.050
		S 19.729	LF -----	-----	
	2R	L 19.978	SF -----	-----	.050
		S 19.729	LF -----	-----	
B FRONT	1F	L 23.748	SF -----	-----	.040
		S 23.498	LF -----	-----	
	2	L 23.748	SF -----	-----	.040
		S 23.498	LF -----	-----	
	3	L 23.748	SF -----	-----	.040
		S 23.498	LF -----	-----	
	4	L 23.748	SF -----	-----	.040
		S 23.498	LF -----	-----	
	5R	L 23.748	SF -----	-----	.040
		S 23.498	LF -----	-----	
C CENTRE	1F	L 30.117	SF 30.166	.049	.048
		S 29.880	LF 29.929	.049	
	2	L 30.117	SF 30.168	.051	.048
		S 29.880	LF 29.930	.050	
	3	L 30.117	SF 30.166	.049	.048
		S 29.880	LF 29.928	.048	
	4	L 30.117	SF 30.165	.048	.048
		S 29.880	LF 29.929	.049	
	5	L 30.117	SF 30.165	.048	.048
		S 29.880	LF 29.928	.048	
	6	L 30.116	SF 30.165	.049	.048
		S 29.880	LF 29.929	.049	
	7R	L 30.116	SF 30.165	.049	.048
		S 29.880	LF 29.929	.049	

Title **HP ROTOR DIAMETERS/STEAM GLAND BORES/CLEARANCES**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by *M. ASHWELL R. ADAMS* Date *2/1/03* Supvr. *M. HUMPHRIES* Approv. *R. Rogers* Date *6/1/03*
J. FITZGERALD

Ref. Drawing:- R277/1338 REV A

L = LARGE Dia.. S = Small Dia. SF = Short Fins. LF = Long Fins

STAGE	RING	ROTOR DIAMETER	STEAM GLAND BORE	TOTAL CLEARANCE	DESIGN CLEARANCE
D REAR	1F	L 27.998	SF -----	-----	.040
		S 27.748	LF -----	-----	
	2	L 27.998	SF -----	-----	.040
		S 27.748	LF -----	-----	
	3	L 27.998	SF -----	-----	.040
		S 27.748	LF -----	-----	
	4R	L 27.999	SF -----	-----	.040
		S 27.748	LF -----	-----	
E REAR	1F	L 22.979	SF -----	-----	.050
		S 22.728	LF -----	-----	
	2R	L 22.979	SF -----	-----	.050
		S 22.728	LF -----	-----	

F = Front ring, R = Rear ring

Title

HP BOTT INNER CYL CONNECTIONS & KEY POSITION MEASUREMENTS

Contract

INTERMOUNTAIN

Unit

1

Serial No.

T11246

Site Issue

A

Date

2/10/02

Checked

SDW

Check List No.

1175

Taken by

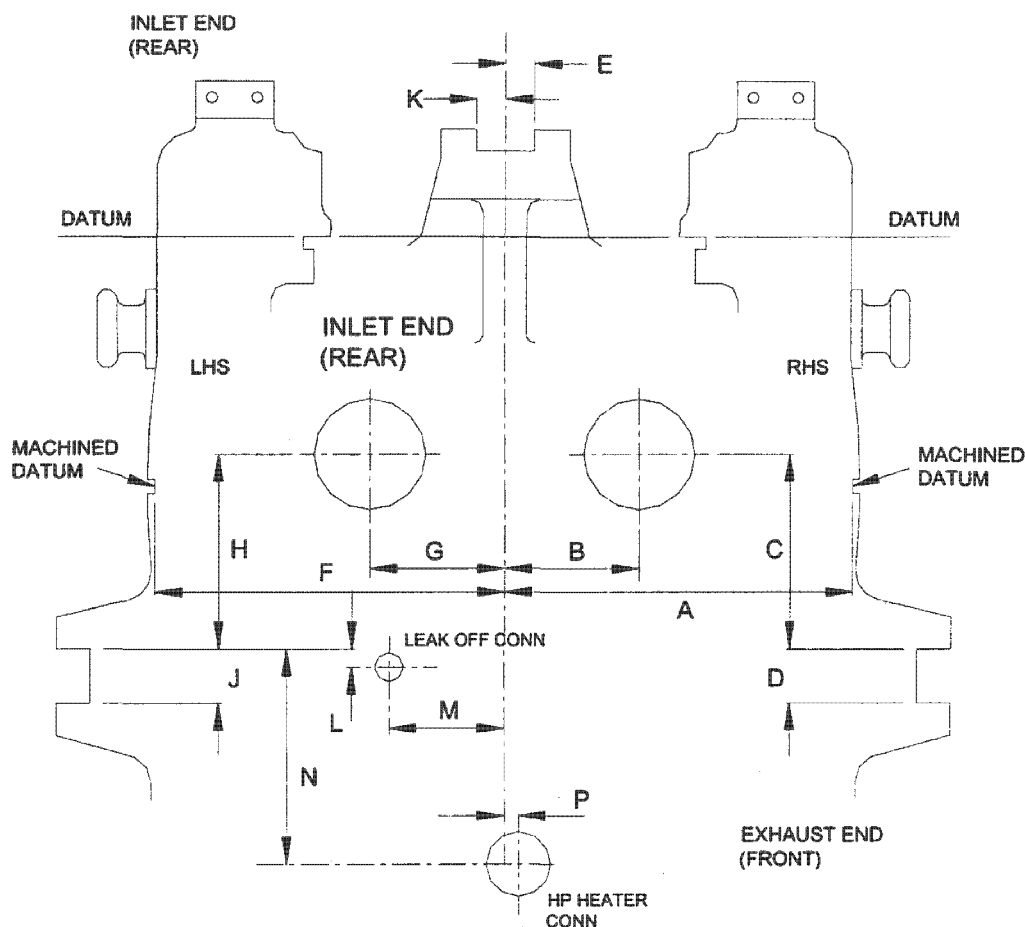
N. GRANGER

Date

*2/1/03*Supvr. *J. CLARK*Approv. *R. Rogers*Date *6/1/03.*

Ref. Drawing:- R202/5360 REV D

NOTE: THE VIEW OF THE BOTTOM HALF INNER CYLINDER IS A PLAN WITH THE HALF JOINT FACING UPWARDS.
THE MEASUREMENTS WILL BE TAKEN WITH THE CYLINDER TURNED OVER.
CARE TO BE TAKEN WITH RECORDING LHS AND RHS CORRECTLY.



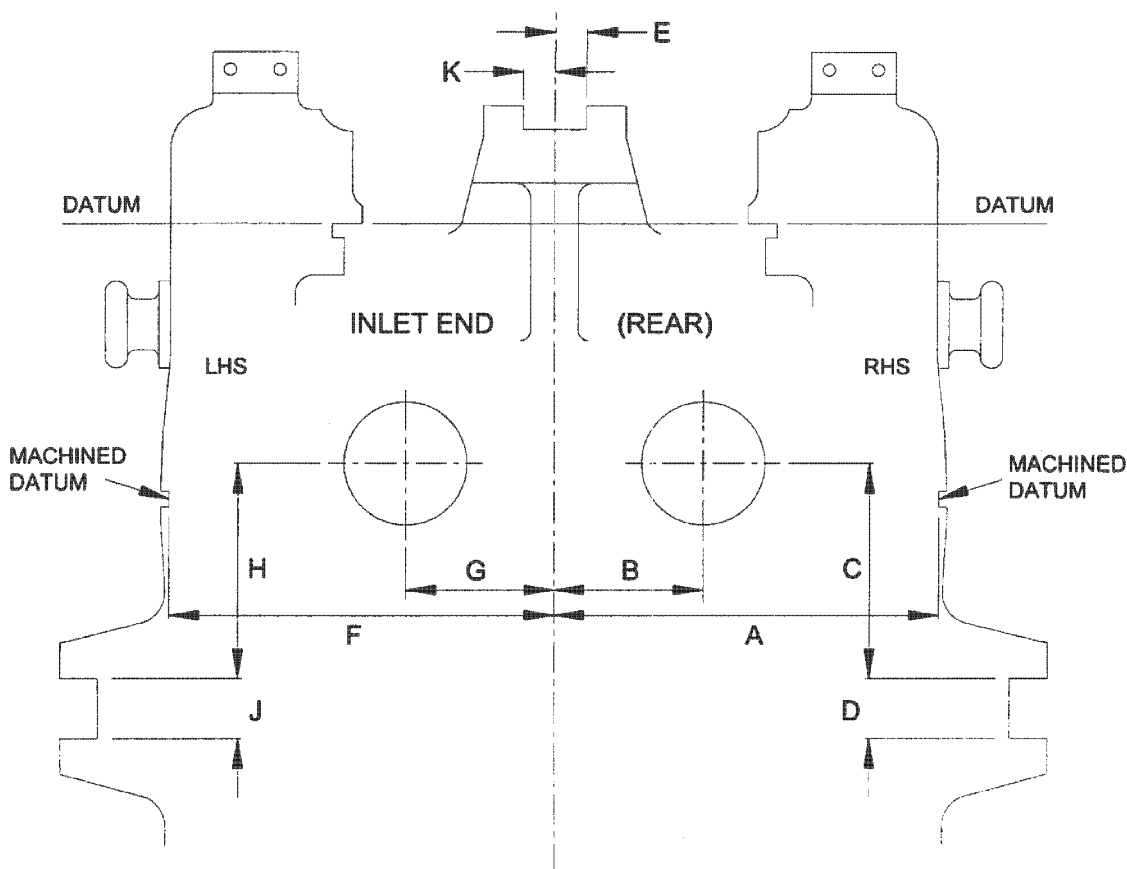
READINGS IN MM

POSITION	A	B	C	D	E
RHS	36.210	13.370	22.965	5.467	2.747
POSITION	F	G	H	J	K
LHS	36.172	13.378	22.965	5.467	2.728
	L	M	N	P (TO LHS OR RHS)	
	14.539	6.754	36.726	.003 L-H-S	

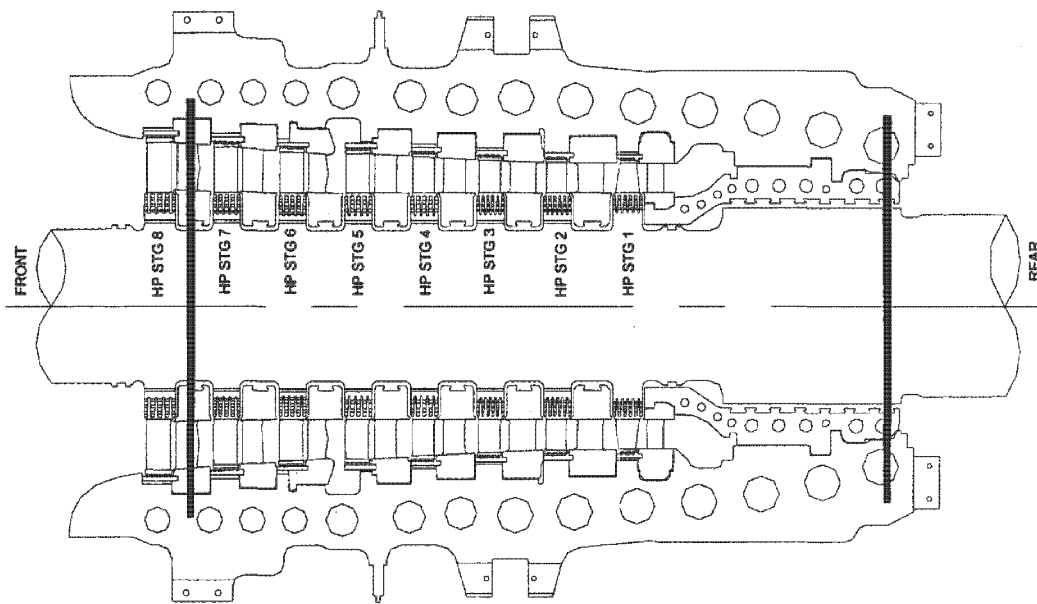
Title **HP TOP INNER CYL CONNECTIONS & KEY POSITION MEASUREMENTS**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by **N. GRANGER** Date **2/1/03** Supvr. **J. CLARK** Approv. **R. Rapin** Date **6/1/03**

Ref. Drawing:- R202/5360 REV D

NOTE: THE VIEW OF THE TOP HALF INNER CYLINDER IS A PLAN WITH THE HALF JOINT FACING DOWNWARDS.
THE MEASUREMENTS WILL BE TAKEN WITH THE CYLINDER TURNED OVER.
CARE TO BE TAKEN WITH RECORDING LHS AND RHS CORRECTLY.



POSITION	A	B	C	D	E
RHS	36.146	13.374	22.955	5.479	2.733
POSITION	F	G	H	J	K
LHS	36.131	13.374	22.955	5.474	2.742

Title **HP ROTOR TO CASING E RAG DATUMS - UNBOXED**Contract **INTERMOUNTAIN** Unit **1** Serial No. **T11246**Site Issue **A** Date **2/10/02** Checked **SDW** Check List No. **1175**Taken by *I. GREENFIELD*
S. SAWYER Date *8/1/03* Supvr. *M. HUMPHRIES* Approv. *RE Rogers* Date *13/1/03*

Note: Vertical datum measurements taken with rotor / gland bottom build clearances established and without any compensation for bolt up distortion.

POSITION	L.H. SIDE	BOTTOM	R.H. SIDE.
HP Diaphragm St.8	0	- .0038"	- .0017"
HP Inlet Ring 7	0	- .0058"	- .0021"